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Choi et al.

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(54) **METHOD OF DRIVING PLASMA DISPLAY PANEL AND PLASMA DISPLAY APPARATUS EMPLOYING THE SAME**

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G09G 3/28 (2006.01)

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(58) **Field of Classification Search** 345/60, 345/67, 68; 315/169.1-169.4
See application file for complete search history.

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(57) **ABSTRACT**

The present invention relates to a method of driving a plasma display panel and a plasma display apparatus employing the same. In the plasma display apparatus, a plurality of scan electrodes formed in a plasma display panel are divided into first and second groups and then supplied with scan signals. When a scan bias voltage supplied in a first subfield of first and second subfields is higher than that supplied in a second subfield of the first and second subfields, a lowest voltage of a reset signal supplied in the second subfield is higher than that supplied in the first subfield. In accordance with the plasma display apparatus of the present invention, the lowest voltage of the reset signal is controlled according to the scan bias voltage in dividing the plurality of scan electrodes into two or more groups and driving them. Accordingly, an address erroneous discharge due to the loss of wall charges can be reduced, the occurrence of spots can be prevented and therefore the image quality of a display image can be improved.

18 Claims, 18 Drawing Sheets

Second group
(Y2)

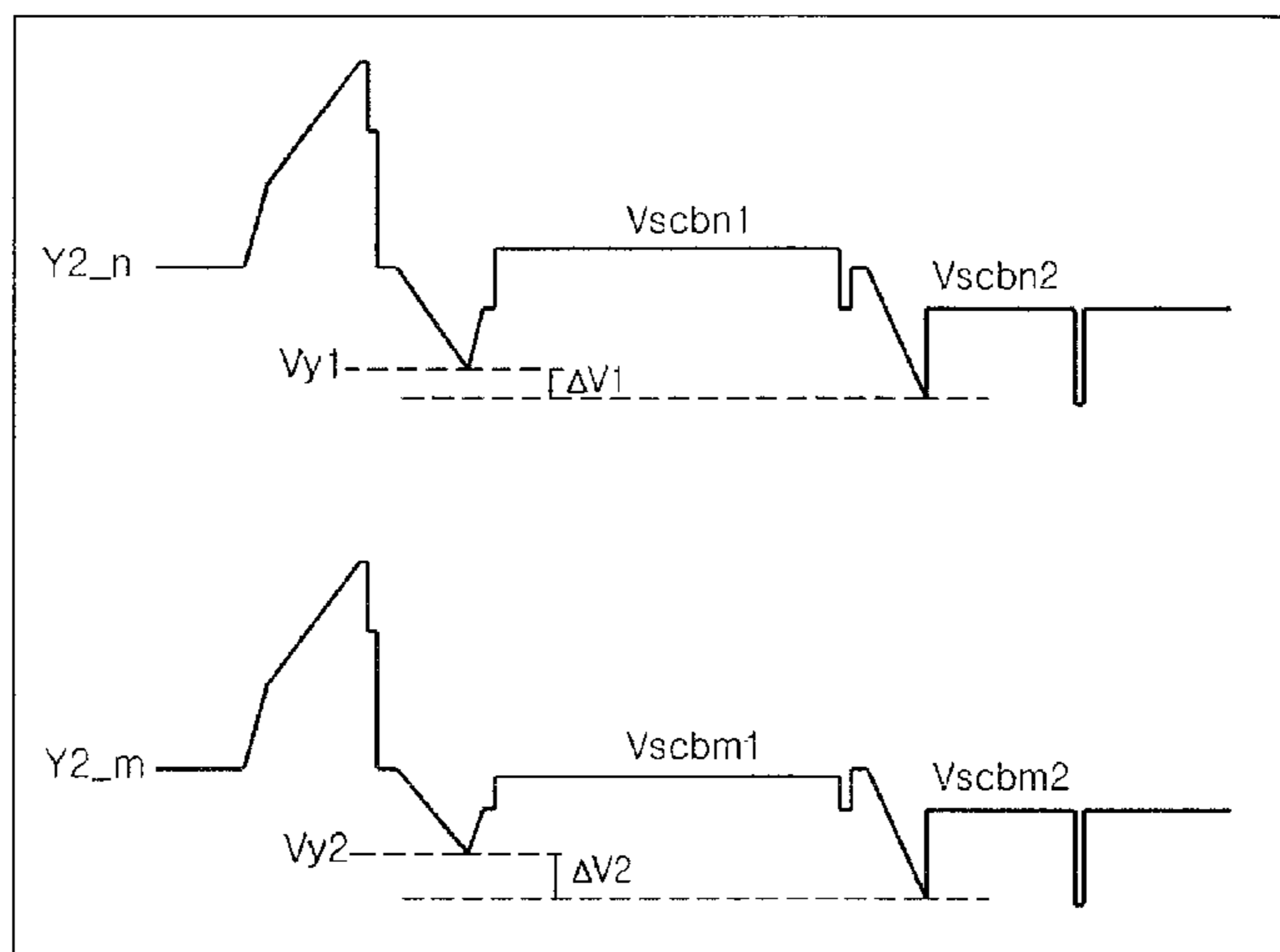


Fig. 1

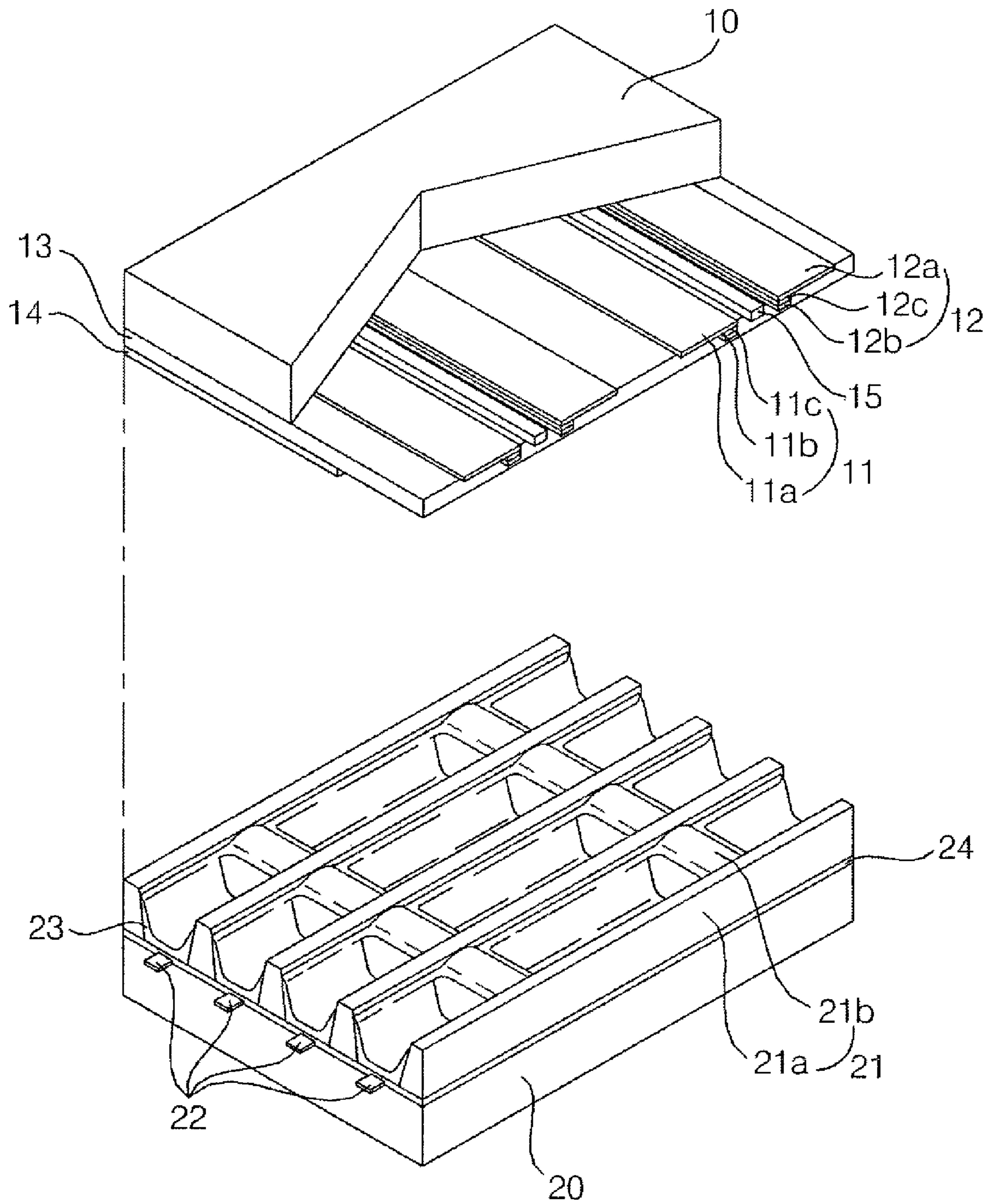


Fig.2

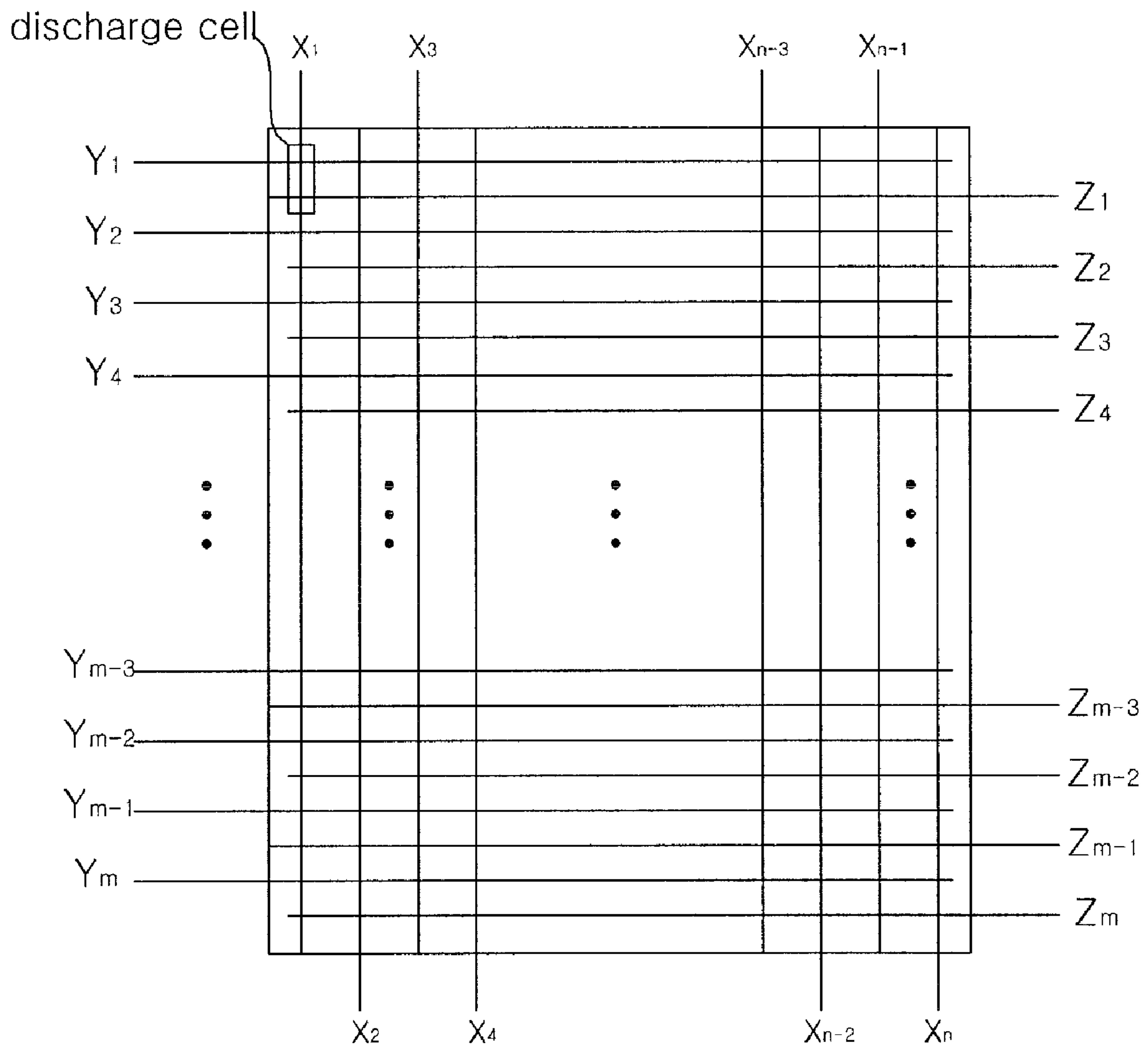


Fig.3

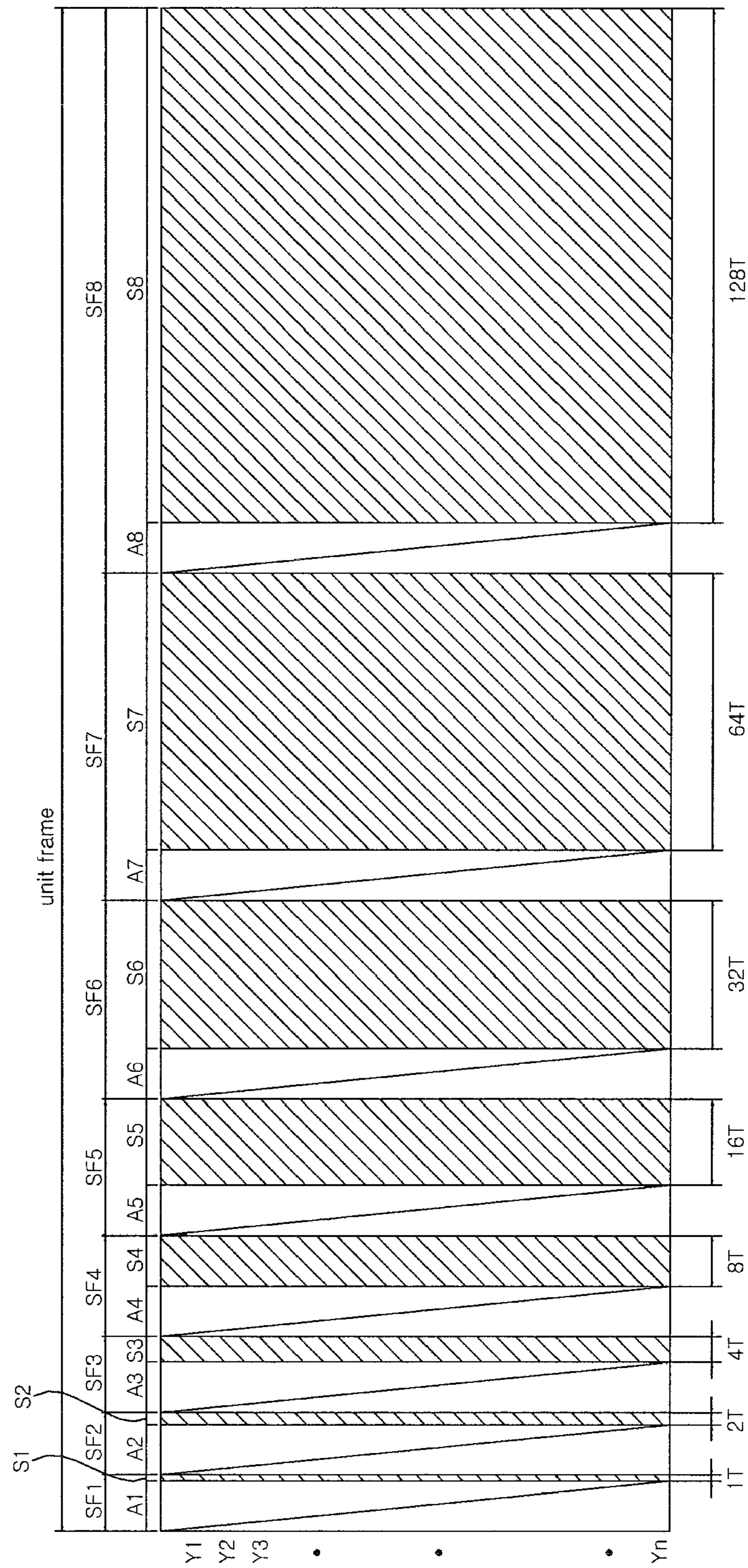


Fig.4

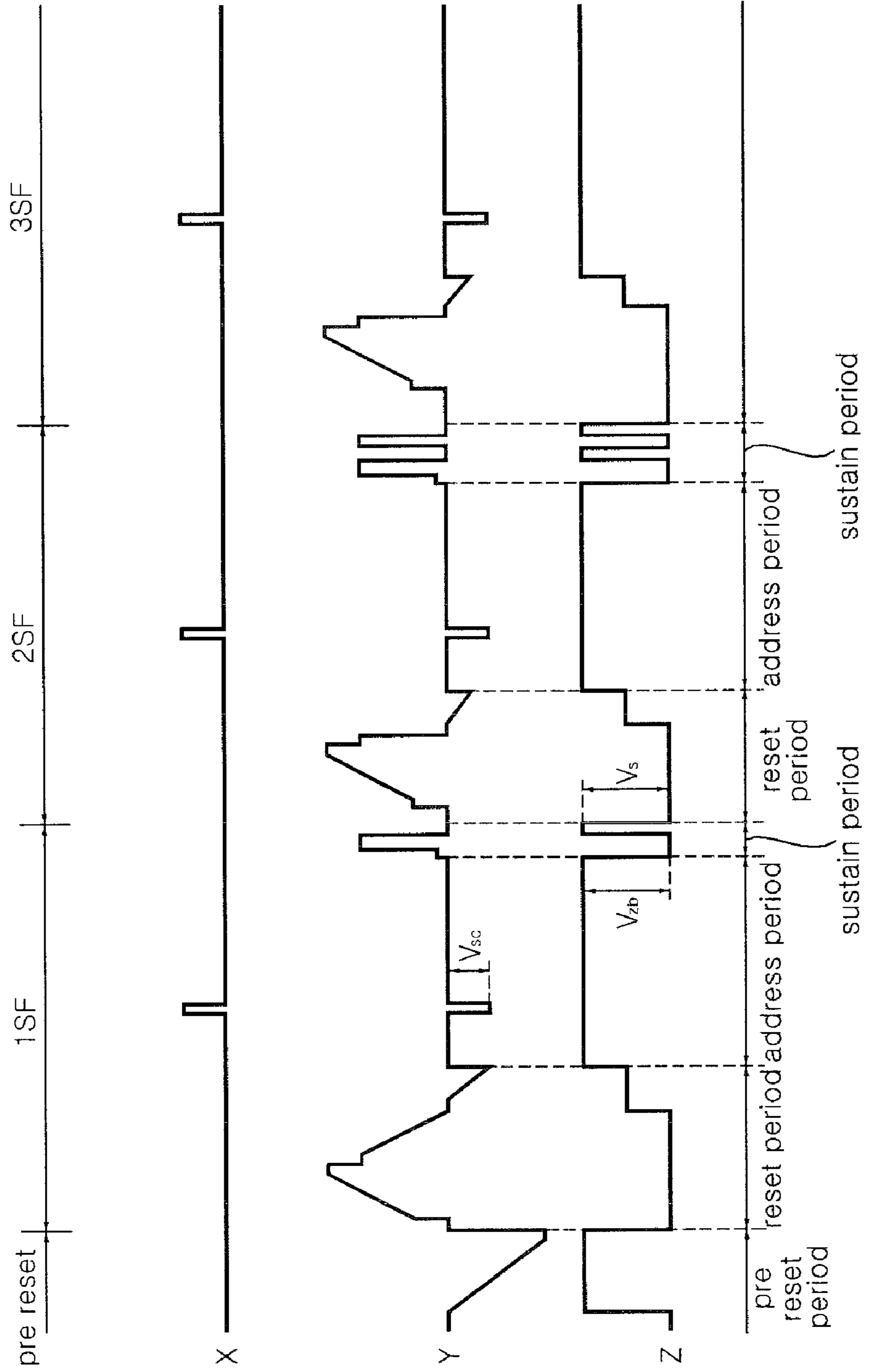


Fig. 5

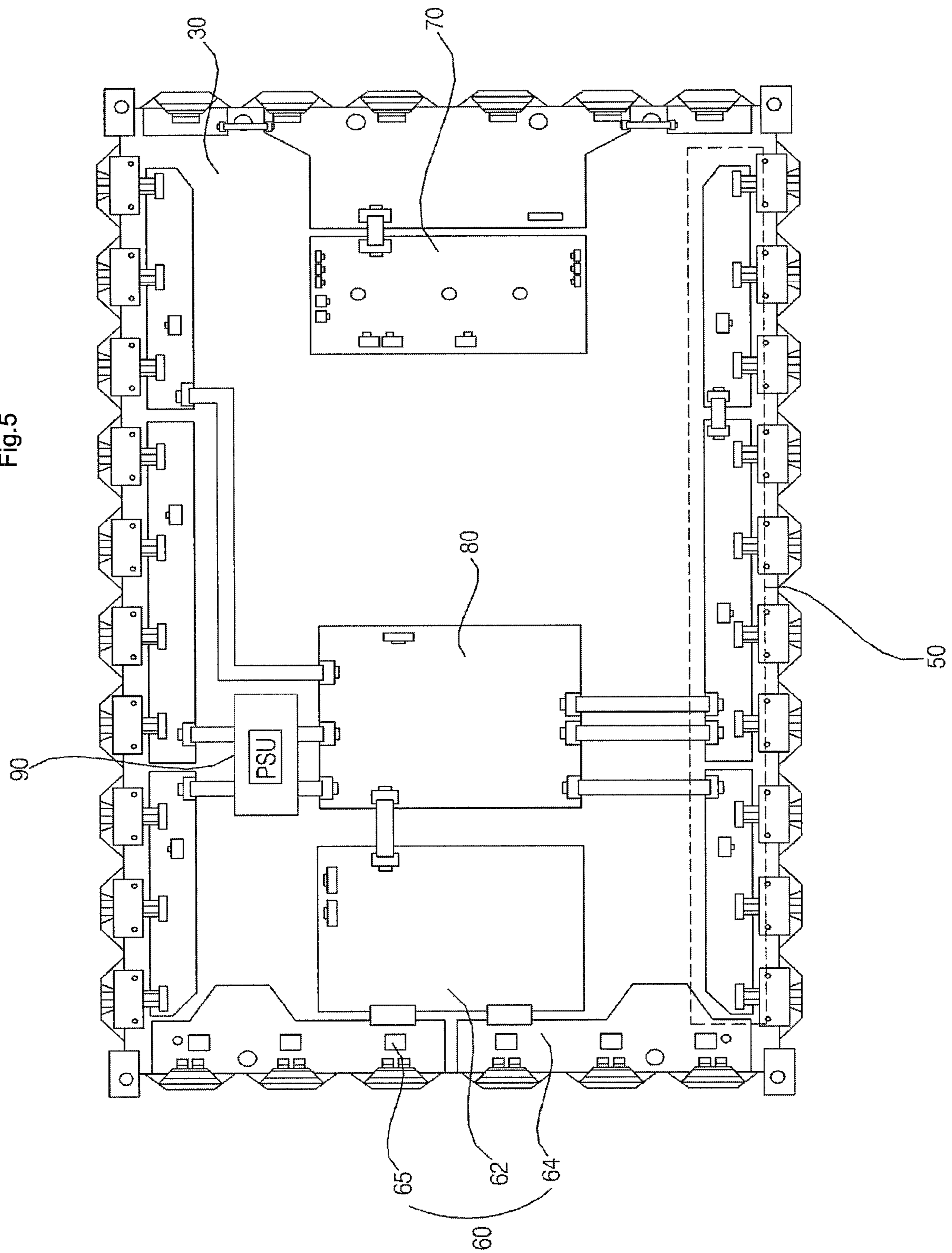


Fig.6

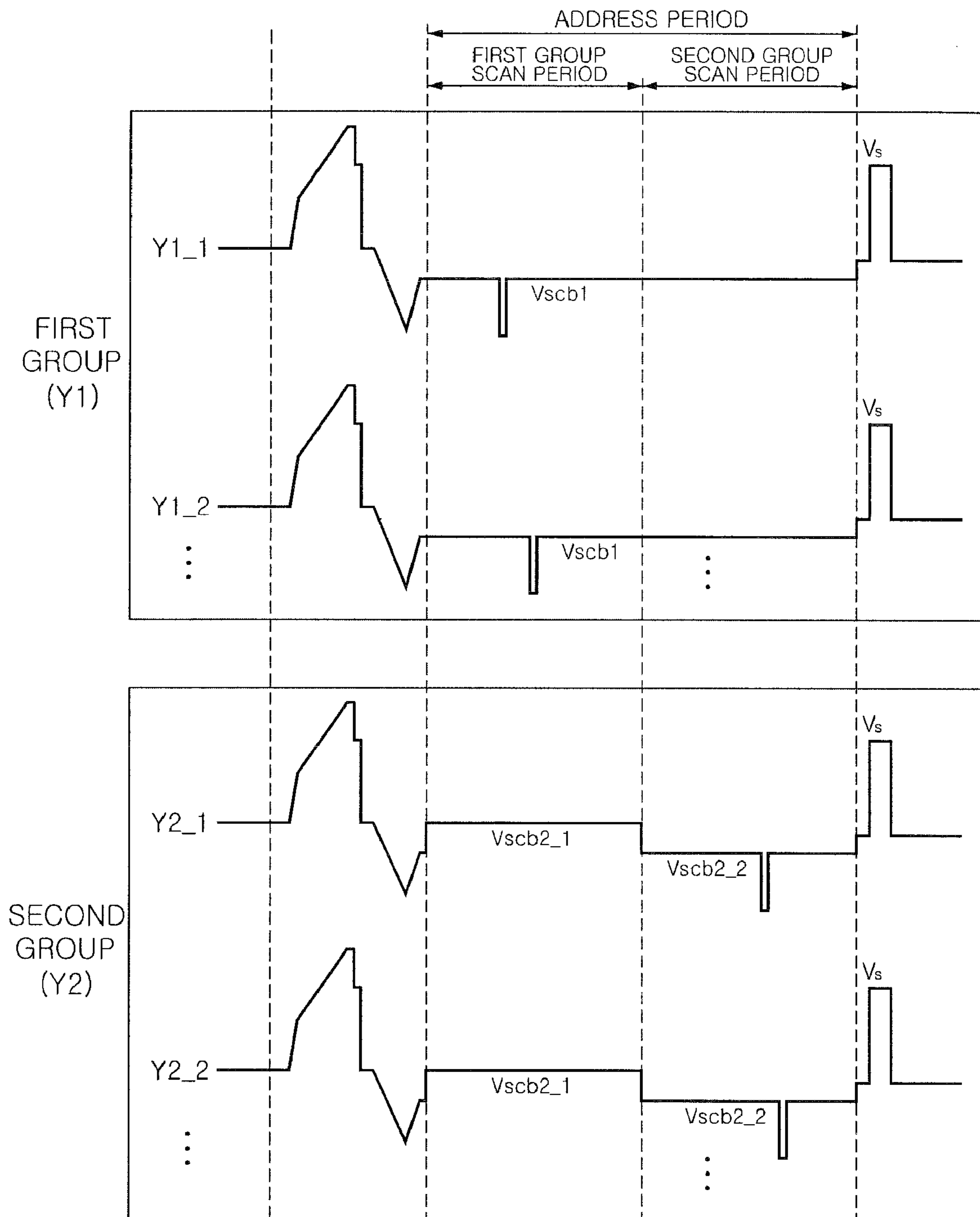


Fig.7

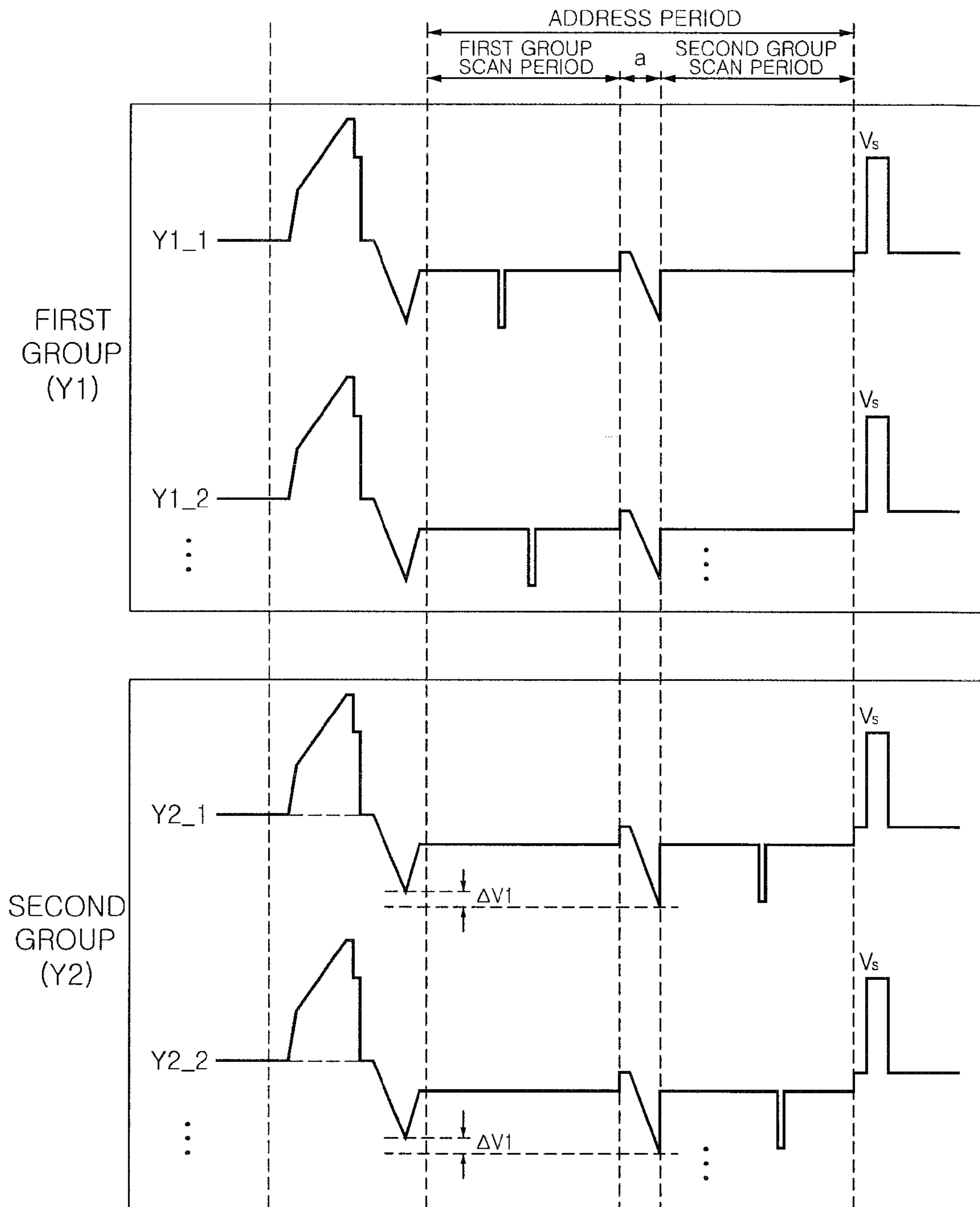


Fig.8

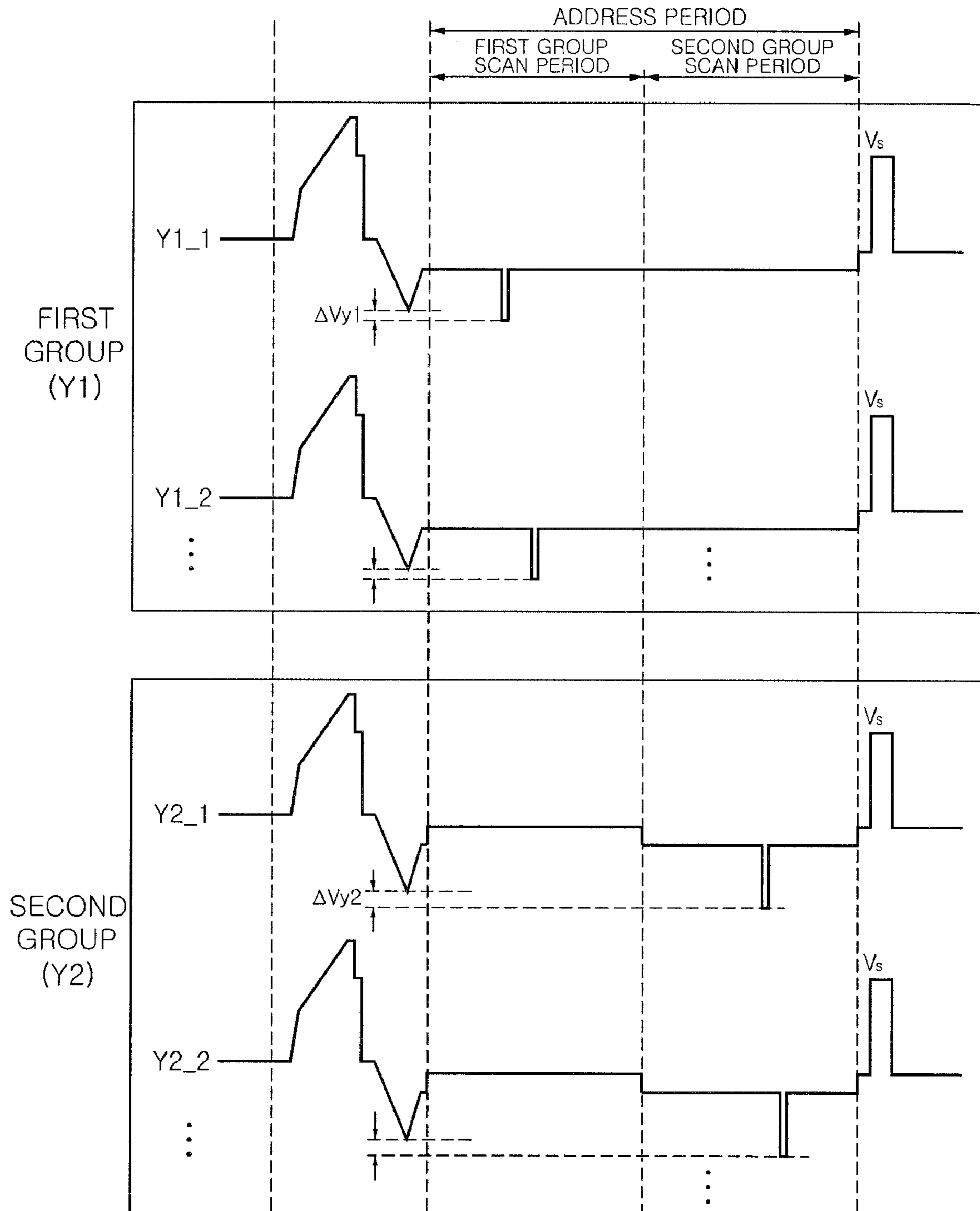


Fig.9

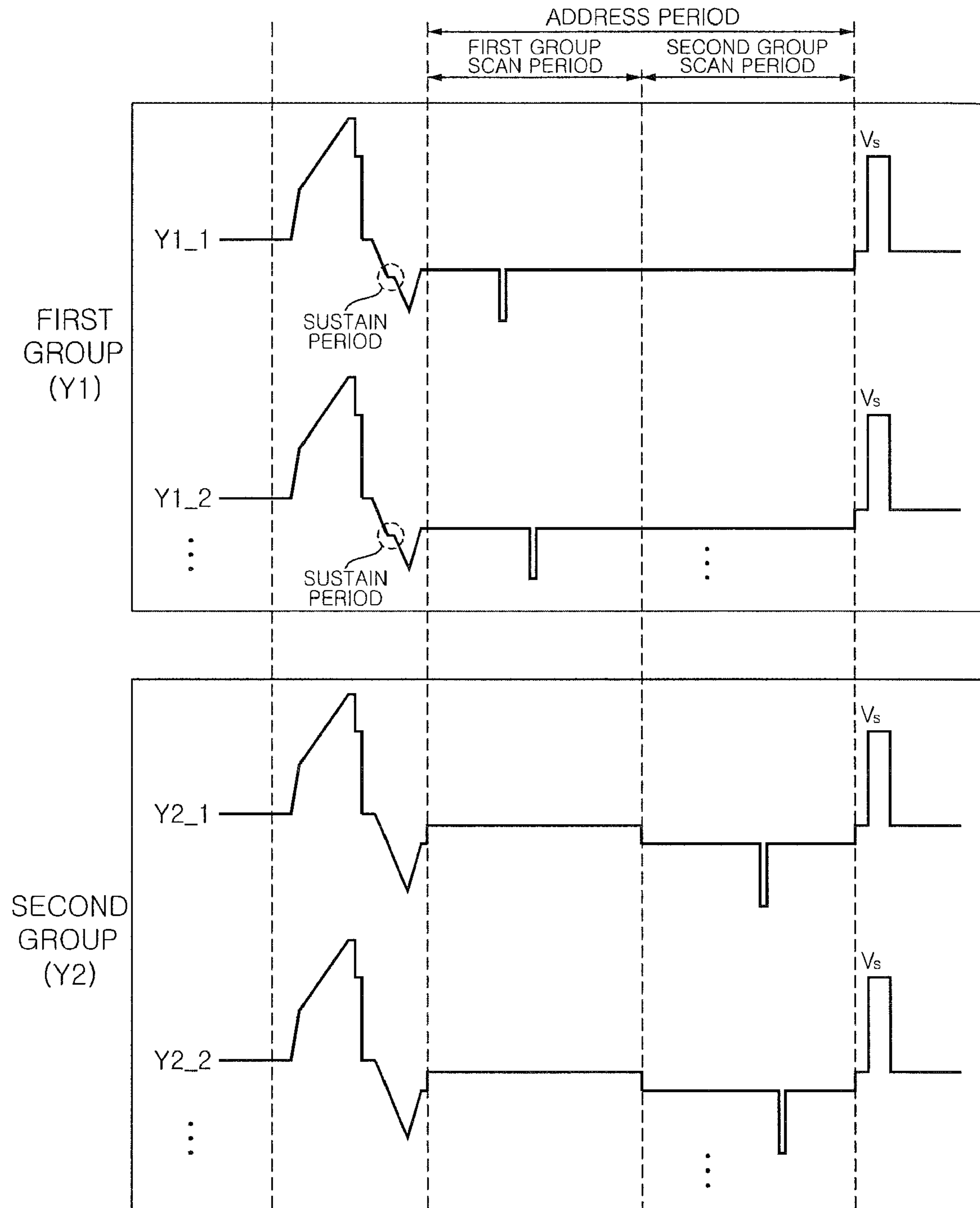


Fig.10

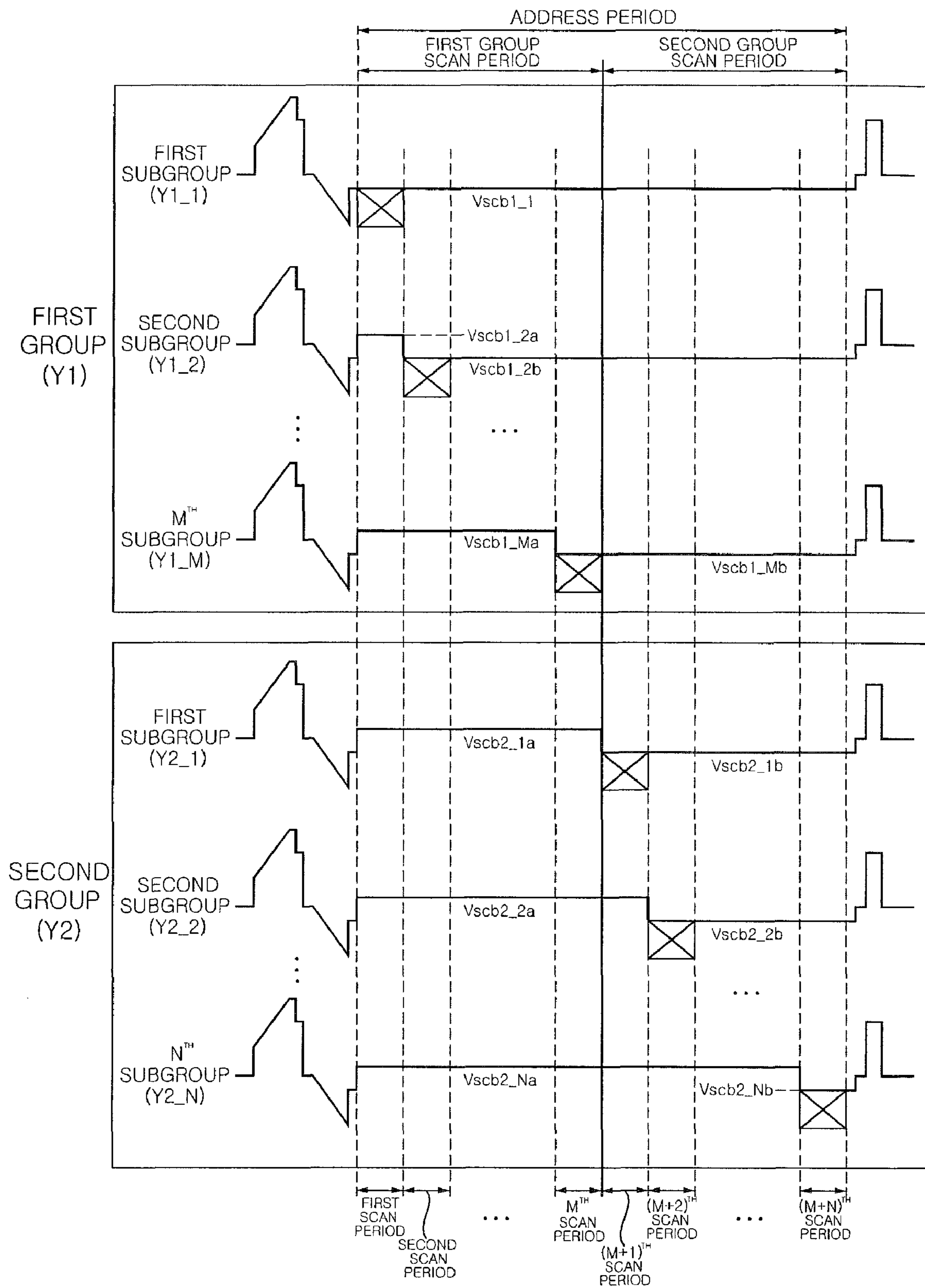


Fig.11

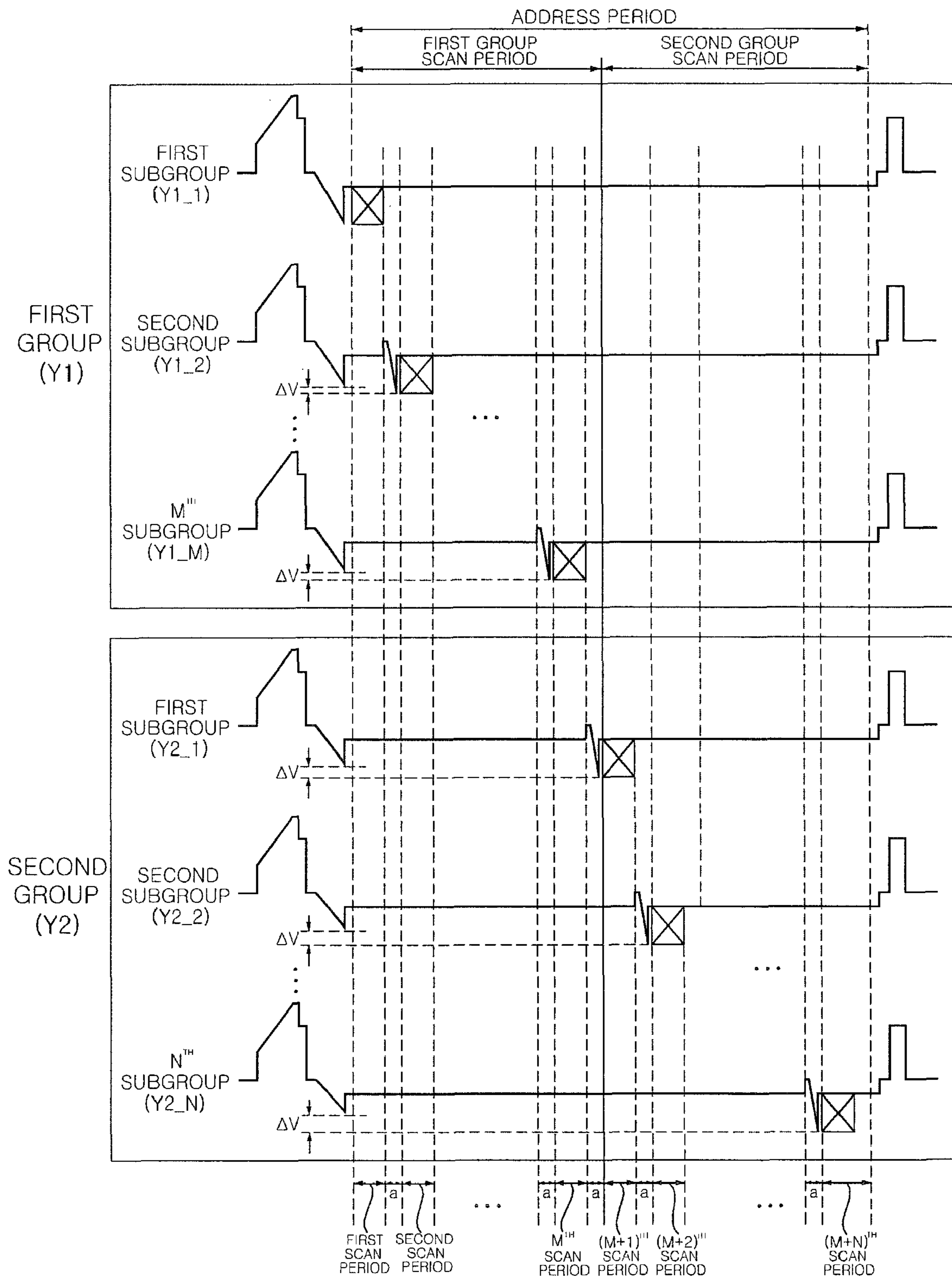


Fig.12

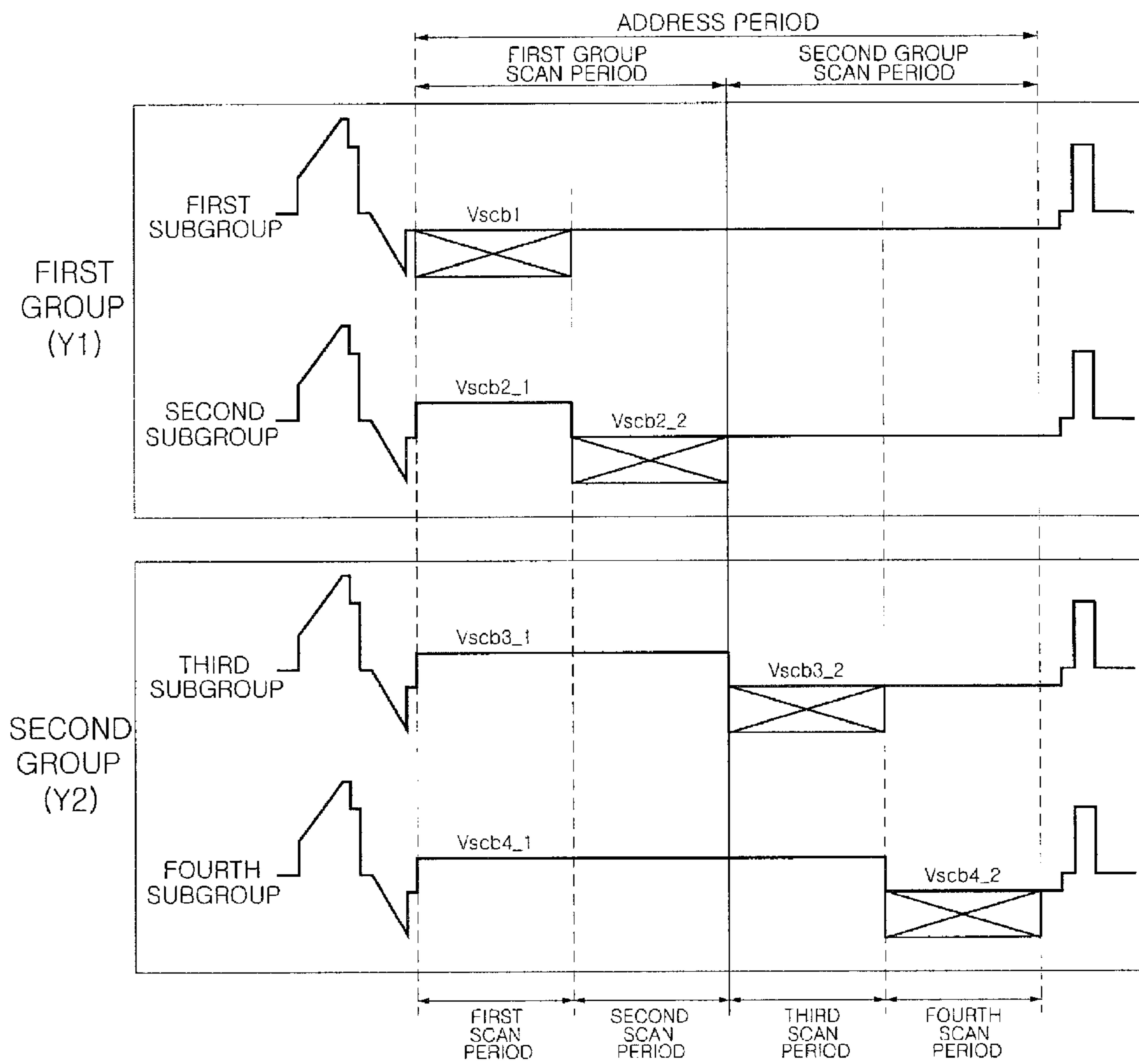


Fig.13

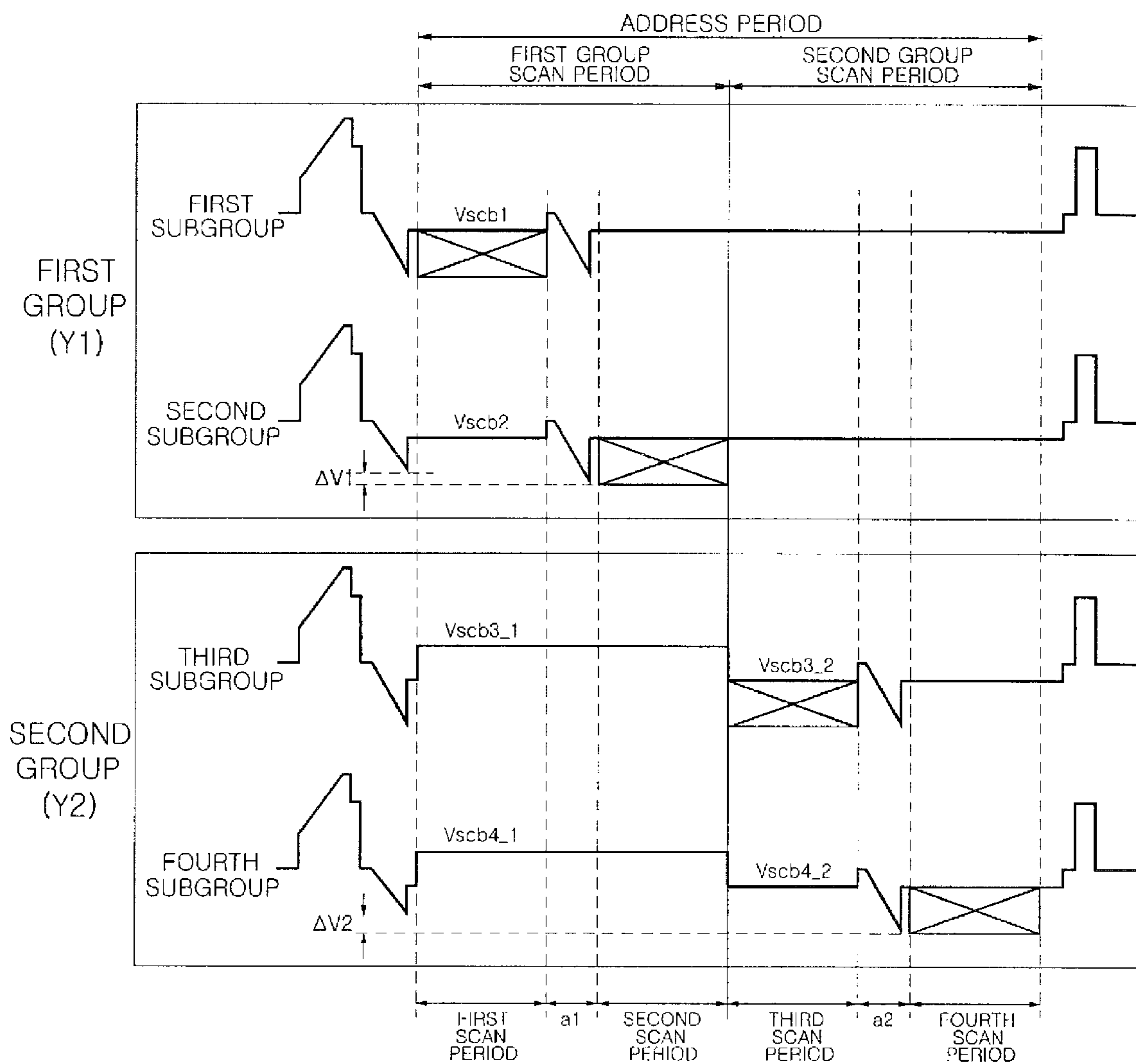


Fig.14

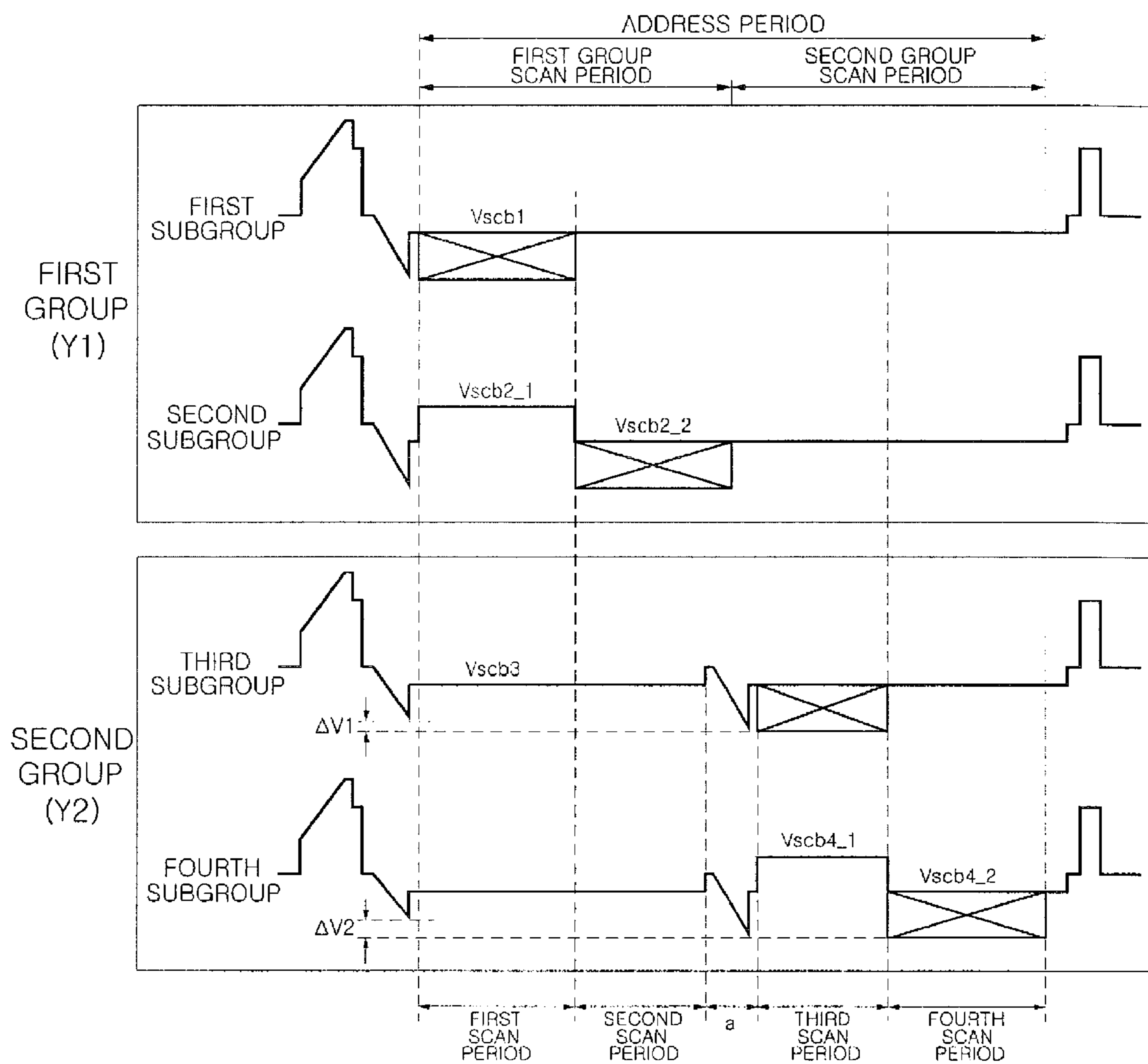


Fig.15

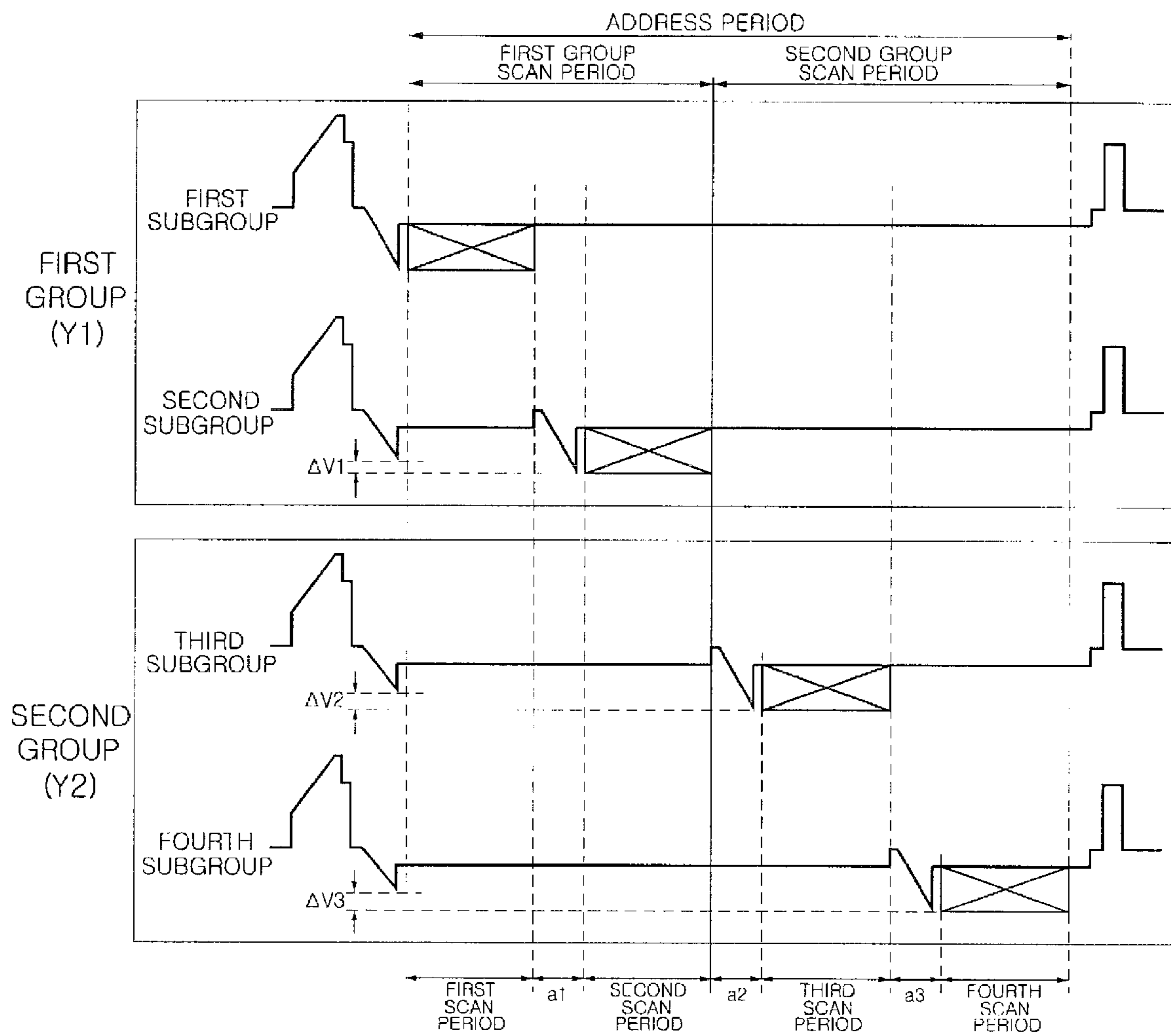


Fig.16

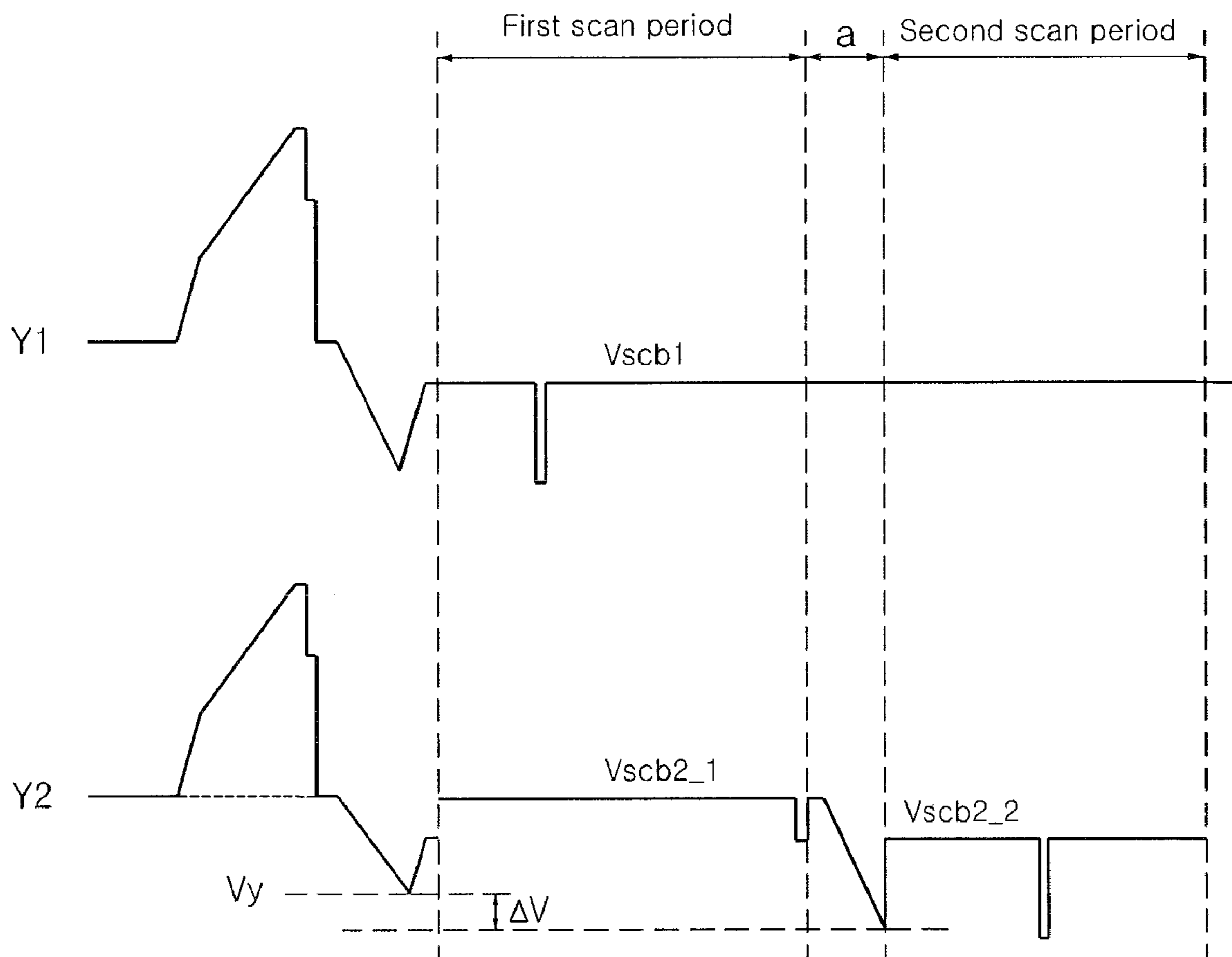


Fig.17

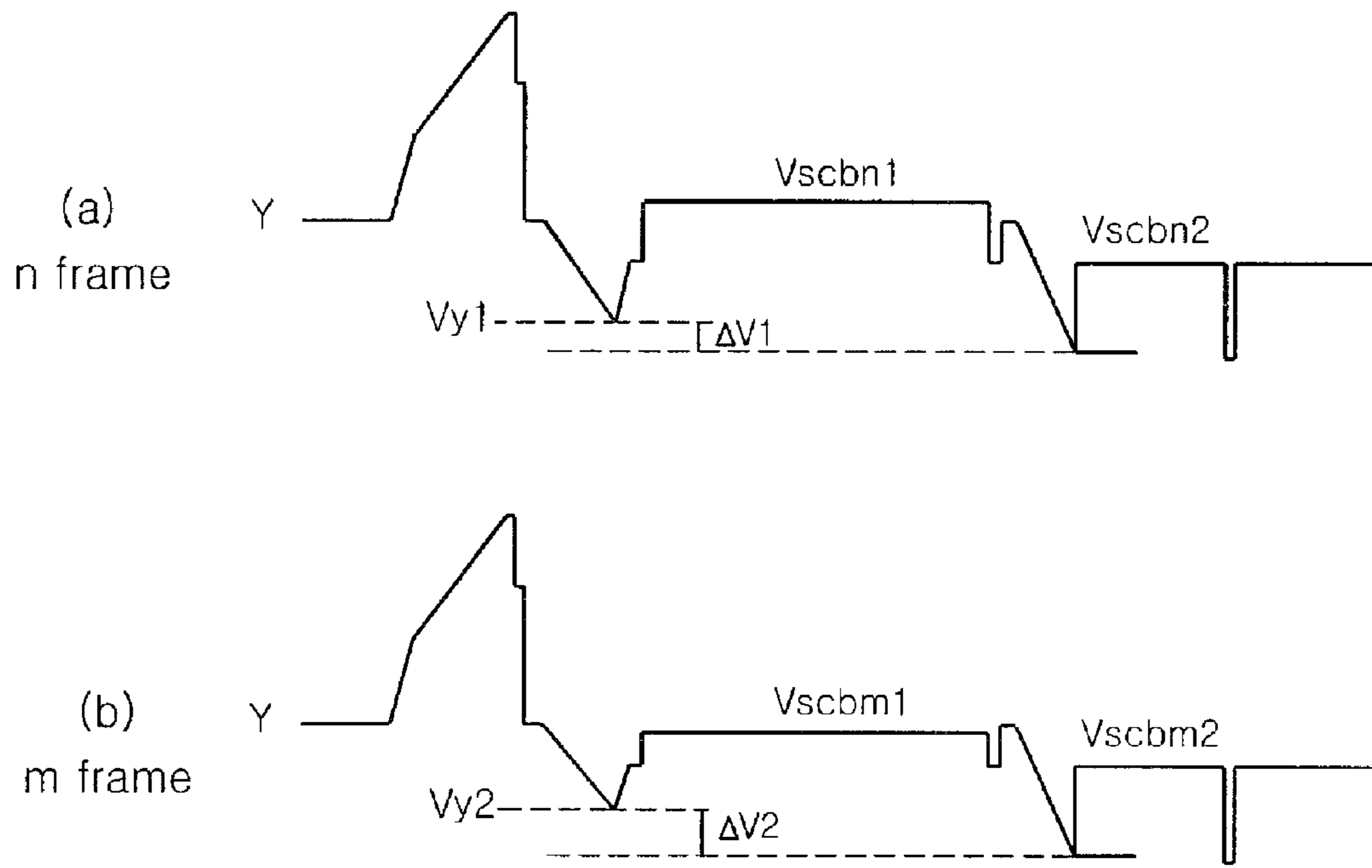


Fig.18

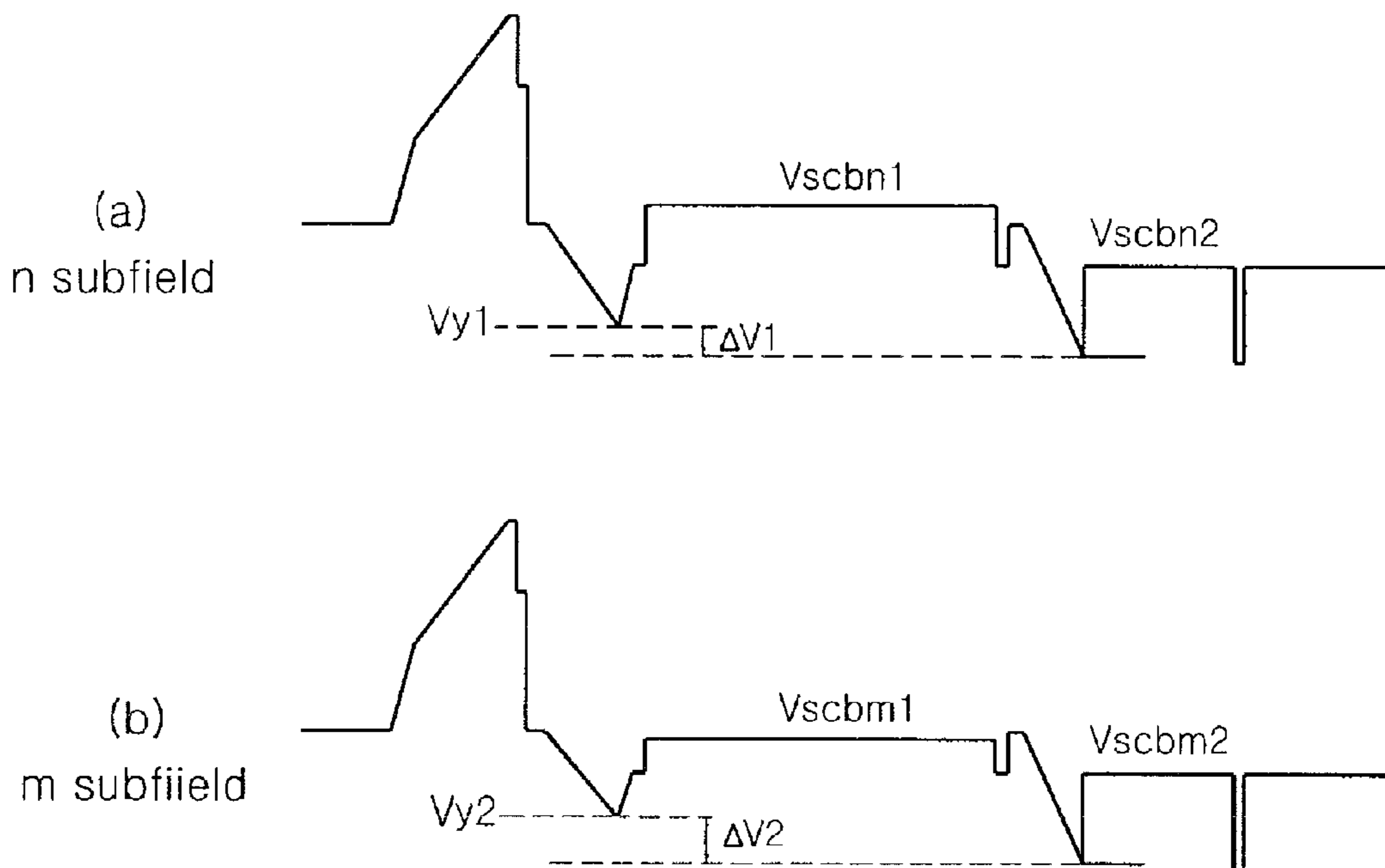
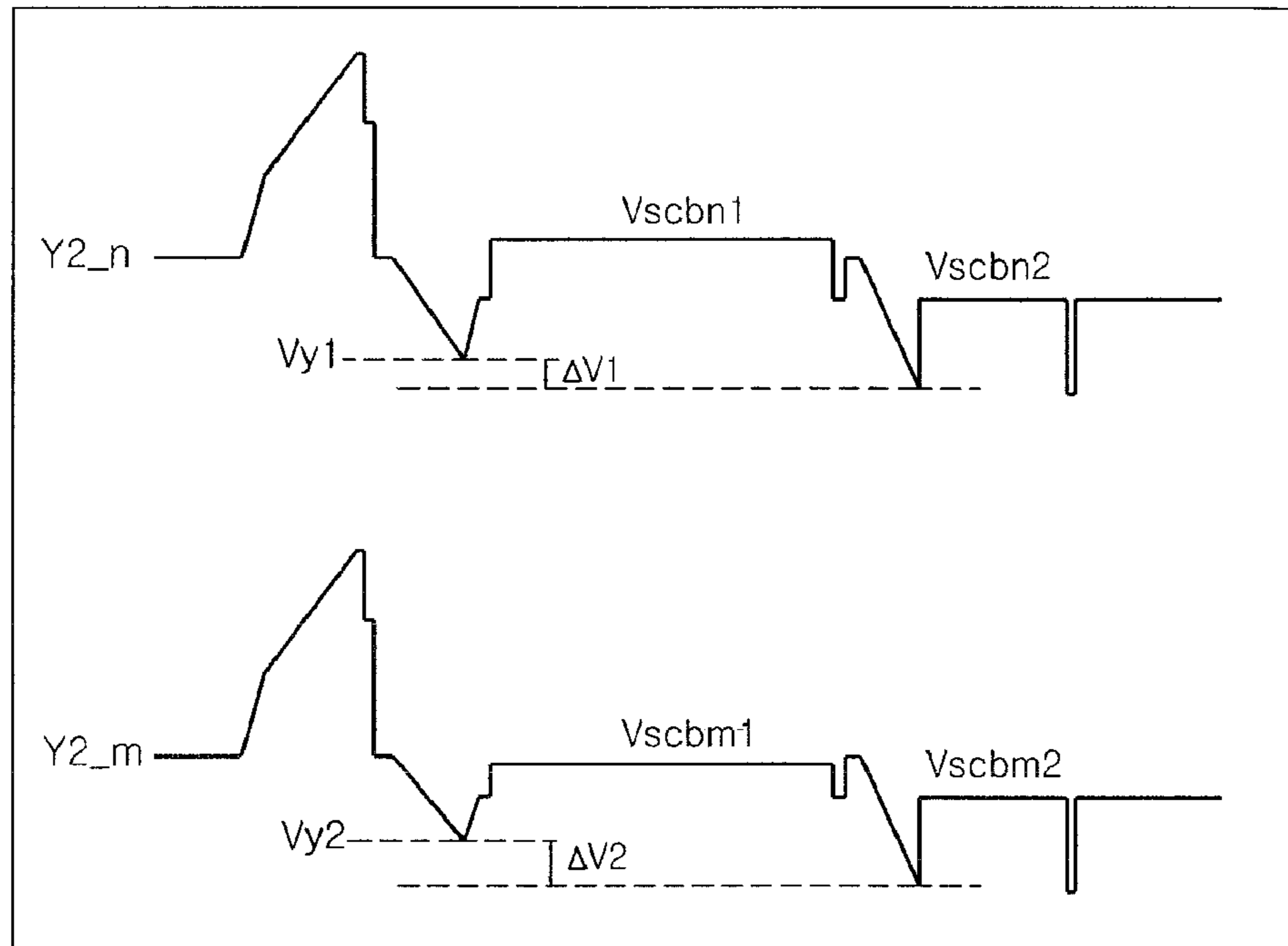


Fig.19

Second group
(Y2)



**METHOD OF DRIVING PLASMA DISPLAY
PANEL AND PLASMA DISPLAY APPARATUS
EMPLOYING THE SAME**

This Nonprovisional application claims priority under 35 U.S.C. §119(a) on Patent Application No. 10-2007-0111022 filed in Korea on Nov. 1, 2007, the entire contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a plasma display apparatus and, more particularly, to a method of driving a plasma display panel.

2. Discussion of Related Art

A plasma display apparatus includes a panel in which a plurality of discharge cells are formed between a lower substrate having barrier ribs formed thereon and an upper substrate opposite to the lower substrate. The plasma display apparatus is configured to display an image in such a manner that the plurality of discharge cells are selectively discharged in response to an input image signal and a fluorescent material is excited with vacuum ultraviolet rays generated by the discharge.

For an effective display of an image, the plasma display apparatus generally includes a driving control device, which processes input image signals and outputs the processed signals to a driver for supplying driving signals to a plurality of electrodes included in a panel.

In the case of a large-screen plasma display apparatus, time margin for panel driving falls short and therefore it is necessary to drive the panel at high speed.

SUMMARY OF THE INVENTION

A plasma display apparatus according to an aspect of the present invention includes a plasma display panel including a plurality of scan electrodes and sustain electrodes formed on an upper substrate, and a plurality of address electrodes formed on a lower substrate, and a driver for supplying driving signals to the plurality of electrodes. The plurality of scan electrodes may be divided into first and second groups and then supplied with scan signal. In at least one period of an address period, first and second scan bias voltages supplied to the first and second groups, respectively, may be different from each other. When the second scan bias voltage supplied in a first subfield of first and second subfields is higher than that supplied in the second subfield of the first and second subfields, a lowest voltage of a reset signal supplied to the second group may be higher in the second subfield of the first and second subfields than in the first subfield of the first and second subfields during a reset period.

According to another aspect of the present invention, there is provided a method of driving a plasma display panel comprising a plurality of scan electrodes and sustain electrodes formed on an upper substrate, and a plurality of address electrodes formed on a lower substrate, including dividing the plurality of scan electrodes into first and second groups. An address period includes first and second group scan periods in which scan signals may be supplied to the first and second groups. In the first group scan period, a second scan bias voltage supplied to the second group may be higher than a first scan bias voltage supplied to the first group. When the second scan bias voltage supplied in a first subfield of first and second subfields is higher than that supplied in the second subfield of the first and second subfields, a lowest voltage of

a reset signal supplied to the second group may be higher in the second subfield of the first and second subfields than in the first subfield of the first and second subfields.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating an embodiment of the structure of a plasma display panel;

FIG. 2 is a sectional view illustrating an embodiment of the electrode arrangements of the plasma display panel;

FIG. 3 is a timing diagram illustrating an embodiment of a method of time-dividing and driving the plasma display panel by dividing one frame into a plurality of subfields;

FIG. 4 is a timing diagram illustrating an embodiment of driving signals for driving the plasma display panel;

FIG. 5 is a view illustrating an embodiment of the construction of a driving apparatus for driving the plasma display panel;

FIGS. 6 to 9 are timing diagrams illustrating embodiments of a method of driving the plasma display panel by dividing scan electrodes of the plasma display panel into two groups;

FIGS. 10 and 11 are timing diagrams illustrating embodiments of a method of driving the plasma display panel by dividing scan electrodes of the plasma display panel into two or more groups;

FIGS. 12 to 15 are timing diagrams illustrating embodiments of a method of driving the plasma display panel by dividing scan electrodes of the plasma display panel into four groups; and

FIGS. 16 to 19 are timing diagrams illustrating embodiments of driving signal waveforms by a method of driving a plasma display panel according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A method of driving a plasma display panel and a plasma display apparatus employing the same according to the present invention will now be described in detail in connection with specific embodiments with reference to the accompanying drawings.

FIG. 1 is a perspective view illustrating an embodiment of the structure of a plasma display panel.

Referring to FIG. 1, the plasma display panel includes a scan electrode 11 and a sustain electrode 12 (that is, a sustain electrode pair), which are formed over an upper substrate 10, and address electrodes 22 formed over a lower substrate 20.

The sustain electrode pair 11 and 12 includes transparent electrodes 11a and 12a generally formed from indium-tin-oxide (ITO), and bus electrodes 11b and 12b. The bus electrodes 11b and 12b may be formed from metal, such as silver (Ag) or chrome (Cr), a stack type of Cr/copper (Cu)/Cr or Cr/aluminum (Al)/Cr. The bus electrodes 11b and 12b are formed on the transparent electrodes 11a and 12a, and function to decrease a voltage drop caused by the transparent electrodes 11a and 12a with a high resistance.

In accordance with an embodiment of the present invention, the sustain electrode pair 11 and 12 may have a stack structure of the transparent electrodes 11a and 12a and the bus electrodes 11b and 12b, but also include only the bus electrodes 11b and 12b without the transparent electrodes 11a and 12a. This structure is advantageous in that it can save the manufacturing cost of the plasma display panel because the transparent electrodes 11a and 12a are not used. The bus electrodes 11b and 12b used in the structure may also be formed using a variety of materials, such as a photosensitive material, other than the above-listed materials.

Black matrices **15** are arranged between the transparent electrodes **11a** and **12a** and the bus electrodes **11b** and **12b** of the scan electrode **11** and the sustain electrode **12**. The black matrix **15** has a light-shielding function of absorbing external light generated outside the upper substrate **10** and decreasing reflection of the light and a function of improving the purity and contrast of the upper substrate **10**.

The black matrices **15** in accordance with an embodiment of the present invention are formed over the upper substrate **10**. Each black matrix **15** may include a first black matrix **15** formed at a location where it is overlapped with a barrier rib **21**, and second black matrices **11c** and **12c** formed between the transparent electrodes **11a** and **12a** and the bus electrodes **11b** and **12b**. The first black matrix **15**, and the second black matrices **11c** and **12c**, which are also referred to as black layers or black electrode layers, may be formed at the same time and, therefore, may be connected physically. Alternatively, they may not be formed at the same time and, therefore, may not be connected physically.

In the event that the first black matrix **15** and the second black matrices **11c** and **12c** are connected to each other physically, the first black matrix **15** and the second black matrices **11c** and **12c** are formed using the same material. However, in the event that the first black matrix **15** and the second black matrices **11c** and **12c** are physically separated from each other, they may be formed using different materials.

An upper dielectric layer **13** and a protection layer **14** are laminated over the upper substrate **10** in which the scan electrodes **11** and the sustain electrodes **12** are formed in parallel. Charged particles generated by discharge are accumulated on the upper dielectric layer **13**. The upper dielectric layer **13** and the protection layer **14** may function to protect the sustain electrode pair **11** and **12**. The protection layer **14** functions to protect the upper dielectric layer **13** from sputtering of charged particles generated at the time of gas discharge and also increase emission efficiency of secondary electrons.

The address electrodes **22** cross the scan electrodes **11** and the sustain electrodes **12**. A lower dielectric layer **24** and the barrier ribs **21** are formed over a lower substrate **20** over which the address electrodes **22** are formed.

Phosphor layers **23** are formed on the surfaces of the lower dielectric layer **24** and the barrier ribs **21**. Each barrier rib **21** has a longitudinal barrier rib **21a** and a traverse barrier rib **21b** formed in a closed type. The barrier rib **21** functions to partition discharge cells physically and prevent ultraviolet rays, which are generated by discharge, and a visible ray from leaking to neighboring discharge cells.

The embodiment of the present invention may also be applied to not only the structure of the barrier ribs **21** shown in FIG. 1, but also various forms of structures of the barrier ribs **21**. For example, the present embodiment may be applied to a differential type barrier rib structure in which the longitudinal barrier rib **21a** and the traverse barrier rib **21b** have different heights, a channel type barrier rib structure in which a channel, which can be used as an exhaust passage, is formed in at least one of the longitudinal barrier rib **21a** and the traverse barrier rib **21b**, a hollow type barrier rib structure in which a hollow is formed in at least one of the longitudinal barrier rib **21a** and the traverse barrier rib **21b**, and so on.

In the differential type barrier rib structure, the traverse barrier rib **21b** may preferably have a higher height than the longitudinal barrier rib **21a**. In the channel type barrier rib structure or the hollow type barrier rib structure, a channel or hollow may be preferably formed in the traverse barrier rib **21b**.

Meanwhile, in the present embodiment, it has been described and shown that the red (R), green (G), and blue (B) discharge cells are arranged on the same line. However, they may be arranged in different forms. For example, the R, G, and B discharge cells may also have a delta type arrangement of a triangle. Alternatively, the discharge cells may be arranged in various forms, such as square, pentagon and hexagon.

Furthermore, the fluorescent layer **23** is excited with ultraviolet rays generated during the discharge of a gas, thus generating a visible ray of one of R, G, and B. Discharge spaces between the upper/lower substrates **10** and **20** and the barrier ribs **21** are injected with an inert mixed gas for discharge, such as He+Xe, Ne+Xe or He+Ne+Xe.

FIG. 2 is a view illustrating an embodiment of electrode arrangements of the plasma display panel. It is preferred that a plurality of discharge cells constituting the plasma display panel be arranged in a matrix form as illustrated in FIG. 2. The plurality of discharge cells are disposed at the intersections of scan electrode lines Y1 to Ym, sustain electrodes lines Z1 to Zm, and address electrodes lines X1 to Xn, respectively. The scan electrode lines Y1 to Ym may be driven sequentially or at the same time. The sustain electrode lines Z1 to Zm may be driven at the same time. The address electrode lines X1 to Xn may be driven with them being divided into even-numbered lines and odd-numbered lines, or driven sequentially.

The electrode arrangements shown in FIG. 2 are only an embodiment of electrode arrangements of the plasma display panel according to the present invention. Therefore, the present invention is not limited to the electrode arrangements and the driving method of the plasma display panel shown in FIG. 2. For example, the present invention may also be applied to a dual scan method of driving two of the scan electrode lines Y1 to Ym at the same time. Alternatively, the address electrode lines X1 to Xn may be driven with them being divided into upper and lower parts on the basis of the center of the plasma display panel.

FIG. 3 is a timing diagram illustrating an embodiment of a method of time-dividing and driving the plasma display panel by dividing one frame into a plurality of subfields. A unit frame may be divided into a predetermined number (for example, eight subfields SF1, . . . , SF8) in order to realize a time-divided gray level display. Each of the subfields SF1, . . . , SF8 is divided into a reset period (not shown), address periods A1, . . . , A8, and sustain periods S1, . . . , S8.

In accordance with an embodiment of the present invention, the reset period may be omitted in at least one of the plurality of subfields. For example, the reset period may exist only in the first subfield, or exist only in a subfield approximately between the first subfield and the entire subfields.

In each of the address periods A1, . . . , A8, a display data signal is applied to the address electrode X, and scan signals corresponding to the scan electrodes Y are sequentially applied to the address electrode X.

In each of the sustain periods S1, . . . , S8, a sustain pulse is alternately applied to the scan electrodes Y and the sustain electrodes Z. Accordingly, sustain discharge is generated in discharge cells on which wall charges are formed in the address periods A1, . . . , A8.

The luminance of the plasma display panel is proportional to the number of sustain discharge pulses within the sustain periods S1, . . . , S8, which is occupied in a unit frame. In the event that one frame to form 1 image is represented by eight subfields and 256 gray levels, different numbers of sustain pulses may be sequentially allocated to the respective subfields at a ratio of 1, 2, 4, 8, 16, 32, 64, and 128. For example, in order to obtain the luminance of 133 gray levels, sustain

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discharge can be generated by addressing the cells during the subfield1 period, the subfield3 period, and the subfield8 period.

The number of sustain discharges allocated to each subfield may be varied depending on the weight of a subfield according to an Automatic Power Control (APC) step. In other words, although an example in which one frame is divided into eight subfields has been described with reference to FIG. 3, the present invention is not limited to the above example, but the number of subfields to form one frame may be changed in various ways depending on design specifications. For example, the plasma display panel may be driven by dividing one frame into eight or more subfields, such as 12 or 16 subfields.

Further, the number of sustain discharges allocated to each subfield may be changed in various ways in consideration of gamma characteristics or panel characteristics. For example, the degree of gray levels allocated to the subfield4 may be lowered from 8 to 6, and the degree of gray levels allocated to the subfield6 may be raised from 32 to 34.

FIG. 4 is a timing diagram illustrating an embodiment of driving signals for driving the plasma display panel with respect to the one divided subfield.

Each subfield includes a pre-reset period where positive wall charges are formed on the scan electrodes Y and negative wall charges are formed on the sustain electrodes Z, a reset period where discharge cells of the entire screen are reset using wall charge distributions formed in the pre-reset period, an address period where discharge cells are selected, and a sustain period where the discharge of selected discharge cells is sustained.

The reset period includes a set-up period and a set-down period. In the set-up period, a ramp-up waveform is applied to the entire scan electrodes at the same time, so that a minute discharge occurs in the entire discharge cells and wall charges are generated accordingly. In the set-down period, a ramp-down waveform, which falls from a positive voltage lower than a peak voltage of the ramp-up waveform, is applied to the entire scan electrodes Y at the same time, so erase discharge is generated in the entire discharge cells. Accordingly, unnecessary charges are erased from the wall charges generated by the set-up discharge and spatial charges.

In the address period, a scan signal having a scan voltage V_{sc} of a negative polarity is sequentially applied to the scan electrodes Y and at the same time, a data signal of a positive polarity is applied to the address electrodes X. Address discharge is generated by a voltage difference between the scan signal and the data signal and a wall voltage generated during the reset period, so the cells are selected. Meanwhile, in order to enhance the efficiency of the address discharge, a sustain bias voltage V_{zb} is applied to the sustain electrode during the address period.

During the address period, the plurality of scan electrodes Y may be divided into two or more groups and sequentially supplied with the scan signal on a group basis. Each of the divided groups may be divided into two or more subgroups and sequentially supplied with the scan signal on a subgroup basis. For example, the plurality of scan electrodes Y may be divided into a first group and a second group. For example, the scan signal may be sequentially supplied to scan electrodes belong to the first group, and then sequentially supplied to scan electrodes belong to the second group.

In an embodiment of the present invention, the plurality of scan electrodes Y may be divided into a first group placed at the even number and a second group placed at the odd number depending upon a position formed on the panel. In another embodiment, the plurality of scan electrodes Y may be

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divided into a first group disposed on an upper side and a second group disposed on a lower side on the basis of the center of the panel.

The scan electrodes belonging to the first group divided according to the above method may be divided into a first subgroup placed at the even number and a second subgroup placed at the odd number, or a first subgroup disposed on an upper side and a second subgroup disposed on a lower side on the basis of the center of the first group.

In the sustain period, a sustain pulse having a sustain voltage V_s is alternately applied to the scan electrode and the sustain electrode, so sustain discharge is generated between the scan electrode and the sustain electrode in a surface discharge form.

A width of a first sustain signal or the last sustain signal of a plurality of sustain signals, which are alternately applied to the scan electrode and the sustain electrode during the sustain period, may be greater than that of the remaining sustain pulses.

After the sustain discharge is generated, an erase period in which wall charges remaining in the scan electrodes or the sustain electrodes of an on-cell selected in the address period are erased by generating weak discharge may be further included posterior to the sustain period.

The erase period may be included in all the plurality of subfields or some of the plurality of subfields. In this erase period, an erase signal for the weak discharge may be applied to electrodes to which the last sustain pulse was not applied in the sustain period.

The erase signal may include a ramp type signal that gradually rises, a low-voltage wide, a high-voltage narrow pulse, an exponential signal, a half-sinusoidal pulse or the like.

In addition, in order to generate the weak discharge, a plurality of pulses may be sequentially applied to the scan electrodes or the sustain electrodes.

The driving waveforms shown in FIG. 4 illustrate embodiments of signals for driving the plasma display panel according to the present invention. However, it is to be noted that the present invention is not limited to the waveforms shown in FIG. 4. For instance, the pre-reset period may be omitted, the polarity and voltage level of the driving signals shown in FIG. 4 may be changed, if appropriate, and the erase signal for erasing wall charges may be applied to the sustain electrode after the sustain discharge is completed. Alternatively, a single sustain driving method in which the sustain signal is applied to either the scan electrode Y or the sustain electrode Z, thus generating sustain discharge is also possible.

FIG. 5 is a view illustrating an embodiment of the construction of a driving apparatus for driving the plasma display panel.

Referring to FIG. 5, a heat sink frame 30 is disposed on the rear surface of the panel, and functions to support the panel and also absorb and dissipate heat generated from the panel. A printed circuit board 40 for applying driving signals to the panel is also disposed on the rear surface of the heat sink frame 30.

The printed circuit board 40 may include an address driver 50 for supplying a driving signal to the address electrodes of the panel, a scan driver 60 for supplying a driving signal to the scan electrodes of the panel, a sustain driver 70 for supplying a driving signal to the sustain electrodes of the panel, a driving controller 80 for controlling the driving circuits, and a power supply unit (PSU) 90 for supplying power to each driving circuit.

The address driver 50 is configured to supply the driving signal to the address electrodes formed in the panel so that

only a discharge cell, which is discharged, of a plurality of discharge cells formed in the panel is selected.

The address driver **50** may be disposed on one of upper and lower sides of the panel or both on them depending on a single scan method or a dual scan method.

The address driver **50** may include a data IC (not shown) for controlling the current applied to the address electrode. Switching for controlling the applied current may be generated in the data IC, so a great amount of heat may be generated from the data IC. Accordingly, a heat sink (not shown) for dissipating heat generated during the control process may be installed in the address driver **50**.

As shown in FIG. **5**, the scan driver **60** may include a scan sustain board **62** connected to the driving controller **80**, and a scan driver board **64** that connects the scan sustain board **62** and the panel.

The scan driver board **64** may be divided into two parts (for example, an upper part and a lower part). Unlike the construction shown in FIG. **5**, the number of the scan driver board **64** may be one or plural.

A scan IC **65** for supplying a driving signal to the scan electrode of the panel may be disposed in the scan driver board **64**. The scan IC **65** may apply reset, scan and sustain signals to the scan electrode consecutively.

The sustain driver **70** supplies a driving signal to the sustain electrode of the panel.

The driving controller **80** may convert an input image signal into data, which will be supplied to the address electrodes, based on signal processing information stored in memory by performing a specific signal process on the input image signal, and arrange the converted data according to a scan sequence, and so on. Further, the driving controller **80** may control driving signal supply time points of the driving circuits by applying a timing control signal to the address driver **50**, the scan driver **60**, and the sustain driver **70**.

FIGS. **6** to **9** are timing diagrams illustrating embodiments of a method of driving the plasma display panel by dividing the scan electrodes of the plasma display panel into two groups.

Referring to FIG. **6**, the plurality of scan electrodes Y formed in the panel may be divided into two or more groups Y1 and Y2. The address period may be divided into first and second group scan periods in which a scan signal is supplied to each of the divided first and second groups. During the first group scan period, the scan signal may be sequentially supplied to scan electrodes Y1 belonging to the first group, and during the second group scan period, the scan signal may be sequentially supplied to scan electrodes Y2 belonging to the second group.

For example, the plurality of scan electrodes Y may be divided into a first group Y1 placed at the even number and a second group Y2 placed at the odd number, from the top of the panel, depending on a position formed on the panel. In another embodiment, the plurality of scan electrodes Y may be divided into a first group Y1 disposed on an upper side and a second group Y1 disposed on a lower side, on the basis of the center of the panel. The plurality of scan electrodes Y may be divided according to several methods except for the above methods. The number of the scan electrodes belonging to the first and second groups Y1 and Y2, respectively, may differ.

During the reset period, negative charges of a negative polarity (-) are formed on the scan electrodes Y for address discharge. A driving signal supplied to the scan electrodes Y during the address period is sustained to the scan bias voltage, and the address discharge is then generated when the scan signal of a negative polarity is supplied sequentially.

In the event that the plurality of scan electrodes Y are divided into the first and second groups and sequentially applied with scan signals, wall charges of a negative polarity (-), which are formed on the scan electrodes Y2 belonging to the second group Y2, may be lost during the first group scan period in which scan signals are supplied to the first group Y1. Due to this, address erroneous discharge in which address discharge is not generated even though scan signals are supplied to the scan electrodes Y2 belonging to the second group Y2 during the second group scan period may be generated.

Therefore, as shown in FIG. **6**, a scan bias voltage Vscb2_1 supplied to the second group Y2 may be increased before the second group scan period in which the scan signal is supplied to the second group Y2 after the reset period (for example, during the first group scan period) in order to reduce the loss of wall charges of a negative polarity (-) formed on the scan electrodes Y2 belonging to the second group.

In other words, in the first group scan period, the scan bias voltage Vscb2_1, which is higher than a scan bias voltage Vscb1 supplied to the first group scan electrodes Y1, may be supplied to the second group scan electrodes Y2 in order to reduce address erroneous discharge.

The scan bias voltage Vscb2_1 supplied to the second group scan electrodes Y2 during the first group scan period may be lower than the sustain voltage Vs. When the scan bias voltage Vscb2_1 is lower than the sustain voltage Vs, an increase of unnecessary power consumption can be prevented and spot erroneous discharge, which is generated when the amount of wall charges formed in the scan electrodes is too many, can also be reduced.

During the first group scan period, a third scan bias voltage Vscb3 of a negative polarity is applied to the first scan group electrodes Y1. If the scan signal is applied to the scan electrodes, a potential difference between the scan signal applied to the scan electrodes and the data signal applied to the address electrode becomes too great due to the bias voltage of a negative polarity, so discharge can be generated easily.

To facilitate address discharge by increasing the potential difference between the scan signal applied to the scan electrodes and the data signal of a positive polarity, which is applied to the address electrodes X during the address period, the scan bias voltage Vscb1 supplied to the first group scan electrodes Y1 during the first group scan period and a scan bias voltage Vscb2_2 supplied to the second group scan electrodes Y2 during the second group scan period may have a voltage of a negative polarity. Accordingly, when taking the ease of a driving circuit construction into consideration, the scan bias voltage Vscb2_1 supplied to the second group scan electrodes Y2 during the first group scan period may be a ground voltage GND, and the scan bias voltage Vcb1 supplied to the first group scan electrodes Y1 during the address period may be constant.

Referring to FIG. **6**, the scan bias voltage supplied to the second group scan electrodes Y2 during the address period may be changed. More specifically, in the address period, the scan bias voltage Vscb2_1 supplied to the second group scan electrodes Y2 during the first group scan period may be higher than the scan bias voltage Vscb2_2 supplied to the second group scan electrodes Y2 during the second group scan period.

In the event that the plurality of scan electrodes is divided into a first group Y1 placed at the even number and a second group Y2 placed at the odd number, different scan bias voltages Vscb1 and Vscb2_1 may be supplied to the first and second group scan electrodes Y1 and Y2 during the first group

scan period as described above. Accordingly, any influence depending on interference between adjacent discharge cells can be reduced.

Further, the scan bias voltage V_{sc2_1} supplied to the scan electrodes $Y2$ belonging to the second group during the first group scan period may have a value greater than 2. In this case, a high scan bias voltage V_{scb2_1} may be supplied to a scan electrode to which the scan bias voltage V_{sc2_1} is subsequently supplied rather than a scan electrode to which the scan bias voltage V_{sc2_1} is first supplied, of the second group scan electrodes $Y2$, during the first group scan period. Thus, loss of wall charges formed in the scan electrodes in the reset period can be reduced more effectively.

The driving waveform as described with reference to FIG. 6 may be applied to some of the plurality of subfields constituting one frame. For example, the driving waveform may be applied to at least one of subfields posterior to a second subfield.

FIG. 7 shows a timing diagram of another embodiment of driving signal waveforms in which the plurality of scan electrodes Y are divided into first and second groups and then sequentially supplied with scan signals. The same parts as those described with reference to FIG. 6, of description of driving waveforms shown in FIG. 7, will not be described for simplicity.

Referring to FIG. 7, there may exist an intermediate period "a" in which a signal that gradually drops is supplied to the scan electrodes Y between a first group scan period in which scan signals are sequentially supplied to first group scan electrodes $Y1$ and a second group scan period in which scan signals are sequentially supplied to second group scan electrodes $Y2$.

As described above, in the setdown period of the reset period, the setdown signal that gradually drops is supplied to the scan electrodes Y , so unnecessary electric charges of wall charges formed in the setup period are erased.

In the event that the scan electrodes Y are divided into a plurality of groups and then sequentially supplied with scan signals, wall charges of a negative polarity (-) formed in the scan electrodes $Y2$ belonging to the second group scan electrodes $Y2$ may be lost during the first group scan period. In other words, at a time point at which the address period begins, the amount of wall charges formed in the second group scan electrodes $Y2$ may be set greater than the amount of wall charges formed in the first group scan electrodes $Y1$ in order to compensate for the loss of wall charges.

For example, the amount of wall charges formed in the second group scan electrodes $Y2$ can be increased at a time point at which the address period begins by increasing the lowest voltage of a setdown signal supplied to the second group scan electrodes $Y2$ during the reset period (an absolute value is reduced), as shown in FIG. 7. Further, after the first group scan period is finished, a signal that gradually drops may be supplied to the second group scan electrodes $Y2$ so as to erase unnecessary wall charges.

To this end, the lowest voltage of a first setdown signal supplied to the second group scan electrodes $Y2$ during the reset period may differ from the lowest voltage of a second setdown signal supplied to the second group scan electrodes $Y2$ during the intermediate period "a". More specifically, the lowest voltage of the first setdown signal may be higher than the lowest voltage of the second setdown signal.

Furthermore, to compensate for the loss of wall charges formed in the second group scan electrodes $Y2$ more effectively, the lowest voltage of the first setdown signal supplied to the second group scan electrodes $Y2$ during the reset period may have a value greater than 2. In this case, a setdown signal

having a high lowest voltage may be supplied to a scan electrode to which the first setdown signal is subsequently supplied rather than a scan electrode to which the first setdown signal is first supplied, of the second group scan electrodes $Y2$.

For example, a lowest voltage difference $\Delta V2$ between the first and second setdown signals supplied to a second scan electrode $Y2_2$ of the second group $Y2$ may be greater than a lowest voltage difference $\Delta V1$ between the first and second setdown signals supplied to a first scan electrode $Y2_1$ of the second group $Y2$.

When considering easiness in terms of the construction of the driving circuit for generating the driving signals of the waveforms, a second setdown signal that gradually drops may also be applied to the first group scan electrodes $Y1$ during the intermediate period "a" between the first and second group scan periods, as shown in FIG. 7. In other words, in case where the second setdown signal is supplied to only the second group scan electrodes $Y2$ during the intermediate period "a", a circuit configuration for supplying the setdown signal may differ on a first- or second-group basis.

Referring to FIG. 7, the lowest voltage of the setdown signal supplied to the first group scan electrodes $Y1$ during the reset period may be lower than the lowest voltage of the setdown signal supplied to the second group scan electrodes $Y2$ during the reset period. Further, when taking the ease of a circuit configuration into consideration, the lowest voltage of the first setdown signal supplied to the first group scan electrodes $Y1$ during the reset period may be identical to the lowest voltage of the second setdown signal supplied to the first and second group scan electrodes $Y1$ and $Y2$ during the intermediate period "a".

For the ease of a driving circuit configuration, falling slopes of the first and second setdown signals may be identical. In this case, the lowest voltages of the first and second setdown signals can be varied as described above by controlling a width of the setdown signal (that is, falling times of the first and second setdown signals).

Further, an amount of the lowest voltage of the first setdown signal supplied to the second group scan electrodes $Y2$ during the reset period may be in reverse proportional to an amount of the lowest voltage of the second setdown signal supplied to the second group scan electrodes $Y2$ during the intermediate period "a". In other words, as the lowest voltage of the first setdown signal supplied to one of the second group scan electrodes $Y2$ during the reset period becomes low, the lowest voltage of the second setdown signal supplied to the scan electrode during the intermediate period "a" may rise. Since the amount of wall charges formed in the scan electrode at the start time point of the address period is decreased as the lowest voltage of the first setdown signal supplied to the second group scan electrode $Y2$ during the reset period is lowered, an erase amount of wall charges formed in the scan electrode can be decreased by raising the lowest voltage of the second setdown signal supplied to the scan electrode during the intermediate period "a". Accordingly, the second group scan electrode $Y2$ may be sustained in an appropriate wall charge state for address discharge.

Unlike FIG. 7, the setdown signal may not be supplied to the second group scan electrodes $Y2$ during the reset period. Thus, the amount of wall charges of a negative polarity (-), which are formed in the second group scan electrodes $Y2$ at the address period start time point, can be further increased.

The driving waveform as described with reference to FIG. 7 may be applied to some of a plurality of subfields constituting one frame. For example, the driving waveform may be applied to at least one of subfields posterior to a second

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subfield. Furthermore, the scan bias voltage supplied to the second group scan electrodes Y2 may be varied as shown in FIG. 6.

Referring to FIG. 8, the lowest voltage of the setdown signal supplied to the first and second scan group electrodes Y1 and Y2 during the reset period may be set higher than the lowest voltage of the scan signal. In this case, the amount of wall charges formed in the first and second scan group electrodes Y1 and Y2 at the start time point of the address period can be further increased, so address discharge can be generated stably.

In order to compensate for the loss of wall charges, formed in the second group scan electrodes Y2, during the first group scan period as described above, the lowest voltage of the setdown signal supplied to the second group scan electrodes Y2 during the reset period may be increased. To this end, a lowest voltage difference ΔV_{y2} between the setdown signal and the scan signal supplied to the second scan group electrodes Y2 may be set greater than a lowest voltage difference ΔV_{y1} between the setdown signal and the scan signal supplied to the first scan group electrodes Y1.

Referring to FIG. 9, a falling period of the setdown signal supplied to the scan electrodes during the reset period may have a discontinuous waveform. In other words, the falling period of the setdown signal may include a first falling period in which a voltage gradually drops to a first voltage, a sustain period in which the voltage is sustained to the first voltage, and a second falling period in which the voltage gradually drops from the first voltage. Further, the setdown signal may include two or more sustain periods.

If a setdown signal having a discontinuous falling period is supplied to the scan electrode during the reset period as described above, the amount of wall charges formed in the scan electrode at the start time point of the address period can be increased and therefore address discharge can be stabilized.

The setdown signal having the discontinuous falling period as shown in FIG. 9 may be supplied to at least one of the first group scan electrodes Y1. Alternatively, the setdown signal having the discontinuous falling period may be applied to at least one of the second group scan electrodes Y2 or both the first and second group scan electrodes Y1 and Y2.

The driving waveforms as described with reference to FIGS. 8 and 9 may be applied to some of a plurality of subfields constituting one frame. For example, the driving waveform may be applied to at least one of subfields posterior to a second subfield.

Further, the driving signal waveforms as shown in FIGS. 6 to 9 may be applied to one of a plurality of subfields at the same time.

FIG. 10 is a timing diagram illustrating an embodiment of a method in which the scan electrode groups divided according to the above methods are driven with them being divided into two or more subgroups, respectively.

Referring to FIG. 10, the plurality of scan electrodes Y formed in the plasma display panel may be divided into first and second groups Y1 and Y2. For example, the plurality of scan electrodes Y may be divided into the first group Y1 placed at the even number and the second group Y2 placed at the odd number on the basis of the top of the panel according to a position formed on the panel. In another embodiment, the plurality of scan electrodes Y may be divided into the first group Y1 disposed on an upper side of the panel and the second group Y1 disposed on a lower side of the panel on the basis of the center of the panel. Alternatively, the plurality of scan electrodes Y may be divided according to several methods other than the above methods. Furthermore, the number

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of the scan electrodes belonging to the first and second groups Y1 and Y2, respectively, may differ.

Alternatively, the first and second group scan electrodes Y1 and Y2 may be divided into a plurality of subgroups. In this case, the plurality of scan electrodes may be sequentially supplied with the scan signals in order of the first and second groups, or may be sequentially supplied with the scan signals on a divided-subgroup basis within the first and second groups.

The number M of the subgroups belonging to the first group may differ from the number N of the subgroups belonging to the second group.

Referring to FIG. 10, a plurality of subgroups Y1_1, . . . , Y1_M and Y2_1, . . . , Y2_N are sequentially supplied with the scan signals during corresponding scan periods (first to $(M+N)^{th}$ scan periods). In other words, the scan signal may be sequentially supplied to the first subgroup scan electrodes Y1_1 belonging to the first group during the first scan period, the scan signal may be sequentially supplied to the second subgroup scan electrodes Y1_2 belonging to the first group during the second scan period, and the scan signal may be sequentially supplied to the first subgroup scan electrodes Y2_1 belonging to the second group during the $(M+1)^{th}$ scan period.

As described above, in each subgroup, wall charges of a negative polarity (-) formed during the reset period may be lost before a period in which the scan signal is supplied, so address erroneous discharge may be generated. For example, in the case of the second subgroup scan electrodes Y1_2 belonging to the first group, wall charges formed in the reset period may be lost during the first scan period, and in the case of the first subgroup scan electrodes Y2_1 belonging to the second group, wall charges formed in the reset period may be lost during the first to M^{th} scan periods. Due to this, address erroneous discharge may be generated.

In order to reduce the loss of wall charges, the amount of the scan bias voltage may be increased during a period from the start time point of the address period until before the supply of the scan signal to a corresponding subgroup.

The amount of the scan bias voltage described above may be smaller than the sustain voltage Vs. If the scan bias voltage is lower than the sustain voltage Vs, an increase of unnecessary power consumption can be prevented and spot erroneous discharge, which occurs when the amount of wall charges formed in the scan electrodes is too many, can also be reduced.

In other words, in the case of the second subgroup scan electrodes Y1_2 belonging to the first group, a scan bias voltage Vscb1_2a supplied during the first scan period may be higher than a scan bias voltage Vscb1_2b during periods posterior to the first scan period (that is, the second to $(M+N)^{th}$ scan periods). Further, in the case of the M^{th} subgroup scan electrodes Y1_M belonging to the first group, a scan bias voltage Vscb1_Ma supplied during the first to $(M-1)^{th}$ scan periods may be higher than a scan bias voltage Vscb1_Mb supplied during the M^{th} to $(M+N)^{th}$ scan periods.

In a similar way, in the second group, in the case of the first subgroup scan electrodes Y2_1, a scan bias voltage Vscb2_1a supplied during the first to M^{th} scan periods may be higher than a scan bias voltage Vscb2_1b supplied during the $(M+1)^{th}$ to $(M+N)^{th}$ scan periods, in the case of the second subgroup scan electrodes Y2_2, a scan bias voltage Vscb2_2a supplied during the first to $(M+1)^{th}$ scan periods may be higher than a scan bias voltage Vscb2_2b supplied during the $(M+2)^{th}$ to $(M+N)^{th}$ scan periods, or in the case of the N^{th} subgroup scan electrodes Y2_N, a scan bias voltage Vscb2_Na supplied

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during the first to $((M+N)-1)^{th}$ scan periods may be higher than a scan bias voltage V_{scb2_Nb} supplied during the $(M+N)^{th}$ scan period.

For the above reason, in accordance with the driving signal according to an embodiment of the present invention, the scan bias voltages supplied to specific two subgroups belonging to the first group at least any time point of the address period may differ. The scan bias voltages supplied to specific two subgroup belonging to the second group at least any time point of the address period may differ. The scan bias voltages supplied to any one subgroup belonging to the first group and any one subgroup belonging to the second group, at least any time point of the address period, may differ.

Referring to FIG. 10, in the case of the first group, the scan bias voltages supplied during the first scan period differ in the first and second subgroups $Y1_1$ and $Y1_2$ or the first and M^{th} subgroups $Y1_1$ and $Y1_M$, and the scan bias voltages supplied during the second to $(M-1)^{th}$ scan periods differ in the second and M^{th} subgroups $Y1_2$ and $Y1_M$.

In the case of the second group, the scan bias voltages supplied during the $(M+1)^{th}$ scan period differ in the first and second subgroups $Y2_1$ and $Y2_2$ or the first and N^{th} subgroups $Y2_1$ and $Y2_M$. The scan bias voltages supplied during the $(M+2)^{th}$ to $((M+N)-1)^{th}$ scan periods differ in the second and N^{th} subgroups $Y2_2$ and $Y2_N$.

Furthermore, the scan bias voltages supplied during the first scan period differ in the first subgroup $Y1_1$ belonging to the first group and a subgroup belonging to the second group. The scan bias voltages supplied during the second scan period differ in the second subgroup $Y1_2$ belonging to the first group and a subgroup belonging to the second group. The scan bias voltages supplied during the M^{th} scan period differ in the M^{th} subgroup $Y1_M$ belonging to the first group and a subgroup belonging to the second group.

As described above, in each of the plurality of subgroups, during the periods in which the scan signal is supplied, the scan bias voltage of a negative polarity may be supplied.

For the ease of a driving circuit configuration, the scan bias voltages V_{scb1_1} , V_{scb1_2b} , . . . , V_{scb1_Mb} , V_{scb2_1b} , . . . , V_{scb2_2b} , . . . , V_{scb2_Nb} supplied during the periods in which the scan signal is supplied may be identical. The scan bias voltages V_{scb1_2a} , . . . , V_{scb1_Ma} , V_{scb2_1a} , . . . , V_{scb2_2a} , . . . , V_{scb2_Na} supplied during the periods before the supply of the scan signal may be a ground voltage GND.

In other words, if the above-mentioned voltage levels are employed, the driving signals of the waveform as shown in FIG. 10 can be supplied to the panel by controlling only the switching timing of the driving circuit without greatly changing a driving circuit configuration for supplying the driving signal waveforms as described with reference to FIGS. 4 to 9.

Furthermore, as described above, as the supply of the scan signal is later, the loss of wall charges may be increased. Thus, the amount of the scan bias voltages V_{scb1_2a} , . . . , V_{scb1_Ma} , V_{scb2_1a} , . . . , V_{scb2_2a} , . . . , V_{scb2_Na} supplied to the respective subgroups during the periods before the scan signal is supplied may be increased as the driving sequence becomes late. In other words, in the first group, during the first scan period, the scan bias voltage V_{scb1_Ma} supplied to the M^{th} subgroup $Y1_M$ may be higher than the scan bias voltage V_{scb1_2a} supplied to the second subgroup $Y1_2$. In the second group, during the first scan period, the scan bias voltage V_{scb2_2a} supplied to the second subgroup $Y2_2$ may be higher than the scan bias voltage V_{scb2_1a} supplied to the first subgroup $Y2_1$. Further, during the first scan period, the scan bias voltage supplied to N subgroups belonging to the second group $Y2$ may

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be higher than the scan bias voltage supplied to M subgroups belonging to the first group $Y1$.

FIG. 11 is a timing diagram illustrating another embodiment of a method in which a plurality of scan electrodes are driven with them being divided into subgroups as described above. The same parts as those described with reference to FIG. 10, of description of driving waveforms shown in FIG. 11, will not be described for simplicity.

Referring to FIG. 11, a signal that gradually drops may be supplied to each of the plurality of subgroups in an intermediate period "a" between two adjacent scan periods of a plurality of scan periods (first to $(M+N)^{th}$ scan periods) in which the scan signals are supplied, so unnecessary wall charges may be erased before the supply of the scan signal.

Furthermore, in order to compensate for the loss of wall charges, which subsequently occurs, by increasing the amount of wall charges formed in the scan electrode at the start time point of the address period, the lowest voltage of a setdown signal supplied to the scan electrodes during the reset period may be increased (an absolute value is lowered).

For example, as shown in FIG. 11, in second to M^{th} subgroups belonging to the first group or subgroups belonging to the second group, the amount of wall charges on the scan electrodes at the start time point of the address period may be increased by raising the lowest voltage of a first setdown signal supplied during the reset period, and the amount of wall charges may be sustained in an appropriate wall charge state for address discharge by supplying a second setdown signal right before the scan period of the subgroup in order to erase unnecessary wall charges.

For the ease of a driving circuit configuration, the falling slopes of the first and second setdown signals may be identical. In this case, the lowest voltages of the first and second setdown signals can be varied, as described above, by controlling the width of the setdown signal (that is, the falling times of the first and second setdown signals).

Furthermore, in order to compensate for the loss of wall charges formed in the scan electrodes more effectively, the lowest voltage of the first setdown signal supplied to the scan electrodes during the reset period may have a value greater than 2. In this case, the lowest voltage of the first setdown signal of a subgroup in which the scan period is placed anterior to the reset period may be lower than the lowest voltage of the first setdown signal of a subgroup in which the scan period is placed posterior to the reset period. For example, the lowest voltage of the first setdown signal supplied to the second subgroup $Y1_2$ belonging to the first group may be lower than the lowest voltage of the first setdown signal supplied to the M^{th} subgroup $Y1_M$ belonging to the first group, and the lowest voltage of the first setdown signal supplied to the first subgroup $Y2_1$ belonging to the second group may be lower than the lowest voltage of the first setdown signal supplied to the second subgroup $Y2_2$ belonging to the second group. Accordingly, a difference ΔV between the lowest voltages of the first and second setdown signals of the subgroups may be increased in a subgroup in which the scan period is positioned behind.

The amount of the lowest voltage of the first setdown signal supplied during the reset period may be in reverse proportion to that of the lowest voltage of the second setdown signal supplied during the intermediate period "a". In other words, the lower the lowest voltage of the first setdown signal supplied to the subgroup during the reset period, the higher the lowest voltage of the second setdown signal supplied to the subgroup during the intermediate period "a".

Unlike FIG. 11, in the remaining subgroups other than the first subgroup $Y1_1$ belonging to the first group, the setdown

signal may not be supplied during the reset period. Accordingly, the amount of wall charges of a negative polarity (-), which are formed in the scan electrodes at the address period start time point, can be further increased.

For the ease of the construction and control of the driving circuit, the slope of the first setdown signal supplied during the reset period may be identical to that of the second setdown signal supplied during the intermediate period "a". The lowest voltage of the second setdown signal may be identical to the lowest voltage of the first setdown signal supplied to the first subgroup Y1_1 belonging to the first group during the reset period. Furthermore, in the remaining subgroups other than the first subgroup Y1_1 belonging to the first group, the lowest voltage of the first setdown signal supplied during the reset period may be identical.

In other words, if the above voltage levels are employed, the driving signals of the waveforms as shown in FIG. 11 can be supplied to the panel by controlling only the switching timing of the driving circuit without greatly changing the conventional driving circuit configuration.

Further, for the ease of the construction and control of the driving circuit, in each of the intermediate periods "a" shown in FIG. 11, the second setdown signals may be supplied to the plurality of subgroups at the same time.

The driving waveforms as described with reference to FIGS. 10 and 11 may be applied to some of a plurality of subfields constituting one frame. For example, the driving waveforms may be applied to at least one of subfields posterior to a second subfield.

Moreover, the driving signal waveforms as shown in FIGS. 10 and 11 may be applied in any one of the plurality of subfields at the same time, or may be applied along with the driving signal waveforms as shown in FIGS. 6 to 9, if appropriate.

Hereinafter, more detailed embodiments of a method of driving the scan electrodes by dividing them into a plurality of subgroups are described by taking a case where first and second groups are respectively divided into two subgroups and then sequentially supplied with the scan signal as an example.

The plurality of scan electrodes Y formed in the plasma display panel may be divided into the first and second groups Y1 and Y2. For example, the plurality of scan electrodes Y may be divided into a first group Y1 placed at the even number and a second group Y2 placed at the odd number, from the top of the panel, depending on a position formed on the panel. In another embodiment, the plurality of scan electrodes Y may be divided into a first group Y1 disposed on an upper side of the panel and a second group Y2 disposed on a lower side of the panel, on the basis of the center of the panel.

Further, the scan electrodes Y1 belonging to the first group may be divided into a first subgroup and a second subgroup. The scan electrodes Y2 belonging to the second group may be divided into a third subgroup and a fourth subgroup.

As an embodiment of a method in which each of the first and second groups is divided into two subgroups, each of the first and second groups may be divided into a first subgroup placed at the even numbers and a second subgroup Y2 placed at the odd number, of the scan electrodes Y1 belonging to the first group, or a first subgroup Y disposed on an upper side and a second subgroup disposed on a lower side, on the basis of the center of the first group. Alternatively, the plurality of scan electrodes may be divided into four or more subgroups according to several methods except for the above methods.

Referring to FIG. 12, during a first scan period, a scan bias voltage Vscb1 supplied to the first subgroup scan electrodes may differ from a scan bias voltage Vscb2_1 supplied to the

second subgroup scan electrodes. In addition, in order to reduce the loss of wall charges in the second subgroup scan electrodes, which occurs during the first scan period, the scan bias voltage Vscb2_1 supplied to the second subgroup scan electrodes may be higher than the scan bias voltage Vscb1 supplied to the first subgroup scan electrodes.

During a third scan period, a scan bias voltage Vscb3_2 supplied to the third subgroup scan electrodes may differ from a scan bias voltage Vscb4_1 supplied to the fourth subgroup scan electrodes. In order to reduce the loss of wall charges in the fourth subgroup scan electrodes, which is generated during the first to third scan periods, during the third scan period, the scan bias voltage Vscb4_1 supplied to the fourth subgroup scan electrodes may be higher than the scan bias voltage Vscb3_2 supplied to the third subgroup scan electrodes.

Furthermore, during the first scan period, the scan bias voltage Vscb1 supplied to the first subgroup scan electrodes may differ from scan bias voltages Vscb3_1 and Vscb4_1 supplied to the third and fourth subgroup scan electrodes. In order to reduce the loss of wall charges in the third and fourth subgroup scan electrodes, which occurs during the first scan period, during the first scan period, the scan bias voltages Vscb3_1 and Vscb4_1 supplied to the third and fourth subgroup scan electrodes may be higher than the scan bias voltage Vscb1 supplied to the first subgroup scan electrodes.

Moreover, during the second scan period, a scan bias voltage Vscb2_2 supplied to the second subgroup scan electrodes may differ from the scan bias voltages Vscb3_1 and Vscb4_1 supplied to the third and fourth subgroup scan electrodes. In order to reduce the loss of wall charges in the third and fourth subgroup scan electrodes, which occurs during the second scan period, during the second scan period, the scan bias voltages Vscb3_1 and Vscb4_1 supplied to the third and fourth subgroup scan electrodes may be higher than the scan bias voltage Vscb2_2 supplied to the second subgroup scan electrodes.

As described above, in order to effectively reduce the loss of wall charges formed in the scan electrodes, the amount of the scan bias voltage may be increased in order of Vscb1, Vscb2_1, Vscb3_1, and Vscb4_1.

However, when considering the ease of the construction and control of the driving circuit, the amounts of the scan bias voltages Vscb2_1, Vscb3_1, and Vscb4_1 may be identical, and the amounts of the scan bias voltages Vscb1, Vscb2_2, Vscb3_2, and Vscb4_2 may be identical.

The scan bias voltages Vscb2_1, Vscb3_1, and Vscb4_1, which are high as described above, may be lower than the sustain voltage Vs. If the scan bias voltages Vscb2_1, Vscb3_1, and Vscb4_1 are lower than the sustain voltage Vs, an increase of unnecessary power consumption can be prevented and spot erroneous discharge, which occurs when the amount of wall charges formed in the scan electrodes is too many, can be reduced.

The first group may include scan electrodes placed at the even numbers, of a plurality of scan electrodes formed in a panel, and the second group include scan electrodes placed at the odd numbers, of the plurality of scan electrodes formed in the panel. Further, the first and second subgroups may include scan electrodes placed at the even numbers and scan electrodes placed at the odd numbers, respectively, of the scan electrodes belonging to the first group, and the third and fourth subgroups may include scan electrodes placed at the even numbers and scan electrodes placed at the odd numbers, respectively, of the scan electrodes belonging to the second group.

Referring to FIG. 13, during a first group scan period, scan bias voltages V_{scb1} and V_{scb2} supplied to the first group scan electrodes may differ from scan bias voltages V_{scb3_1} and V_{scb4_1} supplied to the second group scan electrodes. In addition, in order to reduce the loss of wall charges in the second group scan electrodes, which occurs during the first group scan period, the scan bias voltages V_{scb3_1} and V_{scb4_1} supplied to the second group scan electrodes may be higher than the scan bias voltages V_{scb1} and V_{scb2} supplied to the first group scan electrodes during the first scan period.

Moreover, to reduce the loss of wall charges formed in the scan electrode effectively, the amount of the scan bias voltage may be increased in order of V_{scb1} , V_{scb2} , V_{scb3_1} , and V_{scb4_1} .

However, when taking the ease of the construction and control of the driving circuit into consideration, the amounts of V_{scb1} , V_{scb2} , V_{scb3_2} , and V_{scb4_2} may be identical and the amounts of V_{scb3_1} and V_{scb4_1} may be identical.

The scan bias voltages V_{scb3_1} and V_{scb4_1} , which are high as described above, may be lower than the sustain voltage V_s . If the scan bias voltages V_{scb3_1} and V_{scb4_1} are lower than the sustain voltage V_s , an increase of unnecessary power consumption can be prevented and spot erroneous discharge, which occurs when the amount of wall charges formed in the scan electrodes is too many, can be reduced.

As shown in FIG. 13, signals that gradually fall may be supplied to the first and second subgroup scan electrodes during a first intermediate period "a1" between the first and second scan periods, and signals that gradually fall may be supplied to the third and fourth subgroup scan electrodes during a second intermediate period "a2" between the third and fourth scan periods. At this time, in order to compensate for the loss of wall charges formed in the scan electrodes, the lowest voltage of a setdown signal supplied to the second subgroup scan electrodes may be higher than the lowest voltage of a setdown signal supplied to the first subgroup scan electrodes during the reset period, and the lowest voltage of a setdown signal supplied to the fourth subgroup scan electrodes may be higher than the lowest voltage of a setdown signal supplied to the third subgroup scan electrodes during the reset period.

When considering the ease of the construction and control of the driving circuit, the lowest voltages of the signals supplied during the first and second intermediate periods "a1" and "a2" may be identical to the lowest voltages of the setdown signal supplied to the first and third subgroups during the reset period. Accordingly, a difference between the lowest voltage of the setdown signal supplied to the second subgroup during the reset period and the lowest voltage of the signal supplied to the second subgroup during the first intermediate period "a1" may be $\Delta V1$, and a difference between the lowest voltage of the setdown signal supplied to the fourth subgroup during the reset period and the lowest voltage of the signal supplied to the fourth subgroup during the second intermediate period "a2" may be $\Delta V2$.

In addition, in order to compensate for the loss of wall charges formed in the scan electrode more effectively, the difference $\Delta V2$ may be greater than the difference $\Delta V1$.

Unlike FIG. 13, the signal supplied to the first subgroup during the first intermediate period "a1" or the signal supplied to the third subgroup during the second intermediate period "a2" may be omitted. Further, a signal that gradually drops may be supplied to at least one of the third and fourth subgroups during the first intermediate period "a1" or a signal that gradually drops may be supplied to at least one of the first and second subgroups during the second intermediate period "a2".

The first group may include scan electrodes placed at the even numbers, of a plurality of scan electrodes formed in a panel, and the second group include scan electrodes placed at the odd numbers, of the plurality of scan electrodes formed in the panel. Further, the first and second subgroups may include scan electrodes disposed on an upper side and scan electrodes disposed on a lower upper side, respectively, of the scan electrodes belonging to the first group, and the third and fourth subgroups may include scan electrodes disposed on an upper side and scan electrodes disposed on a lower side, respectively, of the scan electrodes belonging to the second group.

Referring to FIG. 14, signals that gradually fall may be supplied to second group scan electrodes Y2 during an intermediate period "a" between the first and second group scan periods and the third and fourth group scan periods. At this time, in order to compensate for the loss of wall charges formed in the scan electrodes, the lowest voltage of a setdown signal supplied to the second group scan electrodes Y2 during the reset period may be higher than the lowest voltage of a signal supplied to the second group scan electrodes Y2 during the intermediate period "a".

When considering the ease of the construction and control of the driving circuit, the lowest voltage of the signal supplied to the second group scan electrodes Y2 during the intermediate period "a" may be identical to the lowest voltage of the setdown signal supplied to the first group scan electrodes Y1 during the reset period. Accordingly, a difference between the lowest voltage of the setdown signal supplied to the third subgroup during the reset period and the lowest voltage of the signal supplied to the third subgroup during the intermediate period "a" may be $\Delta V1$, and a difference between the lowest voltage of the setdown signal supplied to the fourth subgroup during the reset period and the lowest voltage of the signal supplied to the fourth subgroup during the intermediate period "a" may be $\Delta V2$.

In addition, in order to compensated for the loss of wall charges formed in the scan electrode more effectively, the difference $\Delta V2$ may be greater than the difference $\Delta V1$.

As shown in FIG. 14, during the first scan period, a scan bias voltage V_{scb1} supplied to the first subgroup scan electrodes may differ from a scan bias voltage V_{scb2_1} supplied to the second subgroup scan electrodes. Furthermore, in order to reduce the loss of wall charges formed in the second subgroup scan electrodes, which occurs during the first scan period, the scan bias voltage V_{scb2_1} supplied to the second subgroup scan electrodes may be greater than the scan bias voltage V_{scb1} supplied to the first subgroup scan electrodes during the first scan period.

Further, during the third scan period, a scan bias voltage V_{scb3} supplied to the third subgroup scan electrodes may differ from a scan bias voltage V_{scb4_1} supplied to the fourth subgroup scan electrodes. In addition, in order to reduce the loss of wall charges formed in the fourth subgroup scan electrodes, which is generated during the third scan period, during the third scan period, the scan bias voltage V_{scb4_1} supplied to the fourth subgroup scan electrodes may be higher than the scan bias voltage V_{scb3} supplied to the third subgroup scan electrodes.

In order to reduce the loss of wall charges formed in the scan electrode effectively, the scan bias voltage V_{scb4_1} may be greater than the scan bias voltage V_{scb2_1} .

When considering the ease of the construction and control of the driving circuit, the amounts of the scan bias voltages V_{scb1} , V_{scb2_2} , V_{scb3} , and V_{scb4_2} may be identical and the amounts of the scan bias voltages V_{scb2_1} and V_{scb4_1} may be identical.

The scan bias voltages V_{scb2_1} and V_{scb4_1} , which are high as described above, may be lower than the sustain voltage V_s . If the scan bias voltages V_{scb2_1} and V_{scb4_1} are lower than the sustain voltage V_s , an increase of unnecessary power consumption can be prevented and spot erroneous discharge, which occurs when the amount of wall charges formed in the scan electrodes is too many, can be reduced.

Unlike FIG. 14, a scan bias voltage having the same amount as that of the scan bias voltage V_{scb4_1} may be applied to the fourth subgroup scan electrodes during the first and second scan periods, and a signal that gradually drops may also be applied to the first group scan electrodes Y1 during the intermediate period "a".

The first group may include scan electrodes disposed on an upper side on the basis of the center of a panel, of a plurality of scan electrodes, and the second group may include scan electrodes disposed on a lower side on the basis of the center of the panel, of the plurality of scan electrodes.

Further, the first and second subgroups may include scan electrodes placed at the even numbers and scan electrodes placed at the odd numbers, respectively, of the scan electrodes belonging to the first group. The third and fourth subgroups may include scan electrodes placed at the even numbers and scan electrodes placed at the odd numbers, respectively, of the scan electrodes belonging to the second group.

Referring to FIG. 15, a signal that gradually drops may be supplied to the second subgroup scan electrodes during a first intermediate period "a1" between first and second subgroup scan periods, a signal that gradually drops may be supplied to the third subgroup scan electrodes during a second intermediate period "a2" between the second and third subgroup scan periods, and a signal that gradually drops may be supplied to the fourth subgroup scan electrodes during a third intermediate period "a3" between the third and fourth subgroup scan periods.

At this time, in order to compensate for the loss of wall charges formed in the scan electrodes, the lowest voltage of a setdown signal supplied to the second, third, and fourth subgroup scan electrodes during the reset period may be higher than the lowest voltage of a signal supplied to the second, third, and fourth subgroup scan electrodes during the intermediate periods "a1", "a2", and "a3".

When taking the ease of the construction and control of the driving circuit into consideration, the lowest voltage of the signal supplied to the second, third, and fourth subgroup scan electrodes during the intermediate periods "a1", "a2", and "a3" may be identical to the lowest voltage of the setdown signal supplied to the first subgroup scan electrodes during the reset period. Accordingly, a difference between the lowest voltage of the setdown signal supplied to the second subgroup during the reset period and the lowest voltage of the signal supplied to the second subgroup during the first intermediate period "a1" may be $\Delta V1$, a difference between the lowest voltage of the setdown signal supplied to the second subgroup during the reset period and the lowest voltage of the signal supplied to the second subgroup during the second intermediate period "a2" may be $\Delta V2$, and a difference between the lowest voltage of the setdown signal supplied to the fourth subgroup during the reset period and the lowest voltage of the signal supplied to the fourth subgroup during the third intermediate period "a3" may be $\Delta V3$.

In addition, in order to compensate for the loss of wall charges formed in the scan electrode more effectively, the difference between the lowest voltages may be increased in order of $\Delta V1$, $\Delta V2$, and $\Delta V3$.

Unlike FIG. 15, for the ease of the construction and control of the driving circuit into consideration, a signal that gradu-

ally drops may be applied to the entire scan electrodes Y1 in each of the first, second, and third intermediate periods "a1", "a2", and "a3".

The first group may include scan electrodes disposed on an upper side on the basis of the center of a panel, of a plurality of scan electrodes, and the second group may include scan electrodes disposed on a lower side on the basis of the center of the panel, of the plurality of scan electrodes.

Further, the first and second subgroups may include scan electrodes disposed on an upper side and scan electrodes disposed on a lower side, respectively, of the scan electrodes belonging to the first group, and the third and fourth subgroups may include scan electrodes disposed on an upper side and scan electrodes disposed on a lower side, respectively, of the scan electrodes belonging to the second group.

The driving waveforms as described with reference to FIGS. 10 and 11 may be applied to some of a plurality of subfields constituting one frame. For example, the driving waveforms may be applied to at least one of subfields posterior to a second subfield.

Moreover, the driving signal waveforms as shown in FIGS. 12 to 15 may be applied at the same time in any one of the plurality of subfields, and may also be applied along with the driving signal waveforms as shown in FIGS. 6 to 11, if needed. For example, the setdown signals of the reset period shown in FIGS. 12 to 15 may include a discontinuous falling period and the lowest voltage of the setdown signal may be higher than the lowest voltage of the scan signal.

FIG. 16 shows an embodiment of a driving signal waveform supplied to the scan electrode according to the present invention.

Referring to FIG. 16, the plurality of scan electrodes formed in the panel are divided into a first group Y1 and a second group Y2 and then sequentially supplied with scan signals.

As shown in FIG. 16, in accordance with the driving signals according to the present invention, during a first scan period in which the scan signal is supplied to the first group scan electrode Y1, a scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 may be higher than a scan bias voltage V_{scb1} supplied to the first group scan electrode Y1. A second setdown signal that gradually falls may be supplied to the second group scan electrode Y2 in an intermediate period "a" between the first and second scan periods.

As described above, as the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period becomes high, the loss of wall charges of a negative polarity, which are formed in the second group scan electrode Y2, is decreased. Further, as a lowest voltage V_y of a first setdown signal supplied to the second group scan electrode Y2 during the reset period becomes high, the amount of wall charges of a negative polarity, which are formed in the second group scan electrode Y2 at the start time point of the address period, can be increased.

To this end, in order for wall charges, which are enough to generate an address discharge, to be formed in the second group scan electrode Y2 before the second scan period, the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period may be increased or the lowest voltage V_y of the first setdown signal supplied to the second group scan electrode Y2 during the reset period may be increased.

In other words, if the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period is increased or the lowest voltage V_y of the first setdown signal supplied to the second group scan electrode Y2 during the reset period is increased, the amount of wall

charges formed in the second group scan electrode Y2 can be increased and an address erroneous discharge can be improved.

Therefore, assuming that wall charges enough to generate an address discharge can be formed in the second group scan electrode Y2 when the scan bias voltage V_{sbc2_1} and the lowest voltage V_y of the first setdown signal have values a and b, respectively, the lowest voltage V_y of the first setdown signal may be lowered than the value b when the scan bias voltage V_{sbc2_1} is higher than the value a and the lowest voltage V_y of the first setdown signal may be raised higher than the value b when the scan bias voltage V_{sbc2_1} is lowered than the value a in order to improve an address erroneous discharge.

If the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period is increased, consumption power for panel driving can be increased. If the lowest voltage V_y of the first setdown signal supplied to the second group scan electrode Y2 during the reset period is increased, a possibility that a spot erroneous discharge may occur in environments such as, in particular, high temperature, can be increased.

For this reason, in the driving signals according to the present invention, if the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period is set in inverse proportion to the lowest voltage V_y of the first setdown signal supplied to the second group scan electrode Y2, consumption power for panel driving can be reduced while improving an address erroneous discharge, or the occurrence of a spot erroneous discharge can be reduced.

For example, in order to reduce consumption power for panel driving, the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period may be set to a ground voltage GND, or the lowest voltage V_y of the first setdown signal supplied to the second group scan electrode Y2 may be set to a voltage b of a negative polarity. In addition, in the event that there is a high possibility that a spot erroneous discharge may happen due to high temperature, etc. or a possibility that a spot erroneous discharge may occur is increased due to other environments, the scan bias voltage V_{sbc2_1} may be set higher than the ground voltage and the lowest voltage V_y of the first setdown signal may be set lower than the voltage b of a negative polarity in order to reduce the occurrence of the spot erroneous discharge while improving an address erroneous discharge.

If the lowest voltage V_y of the first setdown signal is high as shown in FIG. 16, a voltage difference ΔV between the first and second setdown signals can be increased and a voltage difference ΔV_y between the first setdown signal and the scan signal can also be increased.

For this reason, the scan bias voltage V_{sbc2_1} supplied to the second group scan electrode Y2 during the first scan period may be in inverse proportion to the voltage difference ΔV between the first and second setdown signals or the voltage difference ΔV_y between the first setdown signal and the scan signal.

FIG. 17 is a timing diagram illustrating an embodiment of a method of controlling the lowest voltages of the scan bias voltage and the setdown signal on a frame basis.

Referring to FIG. 17, a scan bias voltage V_{scbn1} supplied to the scan electrode Y when driving an n frame of a plurality of frames to be displayed may be higher than a scan bias voltage V_{scbm1} supplied to the scan electrode Y when driving a m frame of the plurality of frames, and a lowest voltage V_{y1} of the first setdown signal supplied to the scan electrode Y when driving the n frame may be lower than a lowest

voltage V_{y2} of the first setdown signal supplied to the scan electrode Y when driving the m frame.

In the event that there is a high possibility that a spot erroneous discharge may occur when driving the n frame rather than the m frame (for example, the temperature of the panel rises when driving the n frame), as shown in FIG. 17, the scan bias voltage V_{scbn1} supplied to the scan electrode Y when driving the n frame may be set higher than the scan bias voltage V_{scbm1} supplied to the scan electrode Y when driving the m frame, and the lowest voltage V_{y1} of the first setdown signal supplied to the scan electrode Y when driving the n frame may be set lower than the lowest voltage V_{y2} of the first setdown signal supplied to the scan electrode Y when driving the m frame in order to reduce the occurrence of a spot erroneous discharge while improving an address erroneous discharge.

Referring to FIG. 17, a difference $\Delta V1$ between the lowest voltages of the first and second setdown signals supplied to the scan electrode Y when driving the n frame may be smaller than a difference $\Delta V2$ between the lowest voltages of the first and second setdown signals supplied to the scan electrode Y when driving the m frame, and a difference ΔV_{y1} between the lowest voltages of the first setdown signal and the scan signal supplied to the scan electrode Y when driving the n frame may be smaller than a difference ΔV_{y2} between the lowest voltages of the first setdown signal and the scan signal supplied to the scan electrode Y when driving the m frame.

The driving signal waveforms shown in FIG. 17 may be applied to only some of the plurality of subfields constituting the n frame or the m frame, and only some groups or subgroups of the plurality of scan electrodes.

FIG. 18 is a timing diagram illustrating an embodiment of a method of controlling the lowest voltages of the scan bias voltage and the setdown signal on a subfield basis.

Referring to FIG. 18, a scan bias voltage V_{scbn1} supplied to the scan electrode Y in an n subfield of a plurality of subfields constituting one frame may be higher than a scan bias voltage V_{scbm1} supplied to the scan electrode Y in a m subfield of the plurality of subfields, and a lowest voltage V_{y1} of a setdown signal supplied to the scan electrode Y in the n subfield may be lower than a lowest voltage V_{y2} of a setdown signal supplied to the scan electrode Y in the m subfield.

In the case where the n subfield of the plurality of subfields is a subfield having a high possibility that a spot erroneous discharge may happen (for example, any one of first to third subfields), the scan bias voltage V_{scbn1} supplied to the scan electrode Y in the n subfield may be set higher than the scan bias voltage V_{scbm1} supplied to the scan electrode Y in the m subfield, and the lowest voltage V_{y1} of the setdown signal supplied to the scan electrode Y in the n subfield may be set lower than the lowest voltage V_{y2} of the setdown signal supplied to the scan electrode Y in the m subfield, as shown in FIG. 18, in order to reduce the occurrence of a spot erroneous discharge while improving an address erroneous discharge.

Referring to FIG. 18, a difference $\Delta V1$ between the lowest voltages of the first and second setdown signals supplied to the scan electrode Y in the n subfield may be smaller than a difference $\Delta V2$ between the lowest voltages of the first and second setdown signals supplied to the scan electrode Y in the m subfield, and a difference ΔV_{y1} between the lowest voltages of the first setdown signal and the scan signal supplied to the scan electrode Y in the n subfield may be smaller than a difference ΔV_{y2} between the lowest voltages of the first setdown signal and the scan signal supplied to the scan electrode Y in the m subfield.

The driving signal waveforms shown in FIG. 18 may be applied to only the entire n subfield or the m subfield or some

of the n subfield or the m subfield (that is, some groups or some subgroup of the plurality of scan electrodes).

FIG. 19 is a timing diagram illustrating an embodiment of a method of controlling the lowest voltages of the scan bias voltage and the setdown signal on a scan-electrode basis.

Referring to FIG. 19, a scan bias voltage V_{scbn1} supplied to a n^{th} scan electrode $Y2_n$ of the second group scan electrodes $Y2$ to which the scan signal is supplied posterior to the first group scan electrodes $Y1$ may be higher than a scan bias voltage V_{scbm1} supplied to a m^{th} scan electrode $Y2_m$ of the second group scan electrodes $Y2$, and a lowest voltage V_{y1} of a setdown signal supplied to the n^{th} scan electrode $Y2_n$ may be lower than a lowest voltage V_{y2} of a setdown signal supplied to the m^{th} scan electrode $Y2_m$.

In the case where there is a high possibility that a spot erroneous discharge may happen in a region where the n^{th} scan electrode $Y2_n$ of the plurality of scan electrodes is located, the scan bias voltage V_{scbn1} supplied to the n^{th} scan electrode $Y2_n$ may be higher than the scan bias voltage V_{scbm1} supplied to the m^{th} scan electrode $Y2_m$, and the lowest voltage V_{y1} of the setdown signal supplied to the n^{th} scan electrode $Y2_n$ may be lower than the lowest voltage V_{y2} of the setdown signal supplied to the m^{th} scan electrode $Y2_m$, as shown in FIG. 18, in order to reduce the occurrence of a spot erroneous discharge while improving an address erroneous discharge.

Referring to FIG. 19, a difference $\Delta V1$ between the lowest voltages of the first and second setdown signals supplied to the n^{th} scan electrode $Y2_n$ may be smaller than a difference $\Delta V2$ between the lowest voltages of the first and second setdown signals supplied to the m^{th} scan electrode $Y2_m$, and a difference ΔV_{y1} between the lowest voltages of the first setdown signal and the scan signal supplied to the n^{th} scan electrode $Y2_n$ may be smaller than a difference ΔV_{y2} between the lowest voltages of the first setdown signal and the scan signal supplied to the m^{th} scan electrode $Y2_m$.

As described above, the second group scan electrodes $Y2$ may be divided into two or more subgroups. In such a case, the driving signal waveforms shown in FIG. 19 may be applied to some of the two or more subgroups.

The present invention may also be implemented in computer-recordable media using codes that can be read by the computer. The computer-recordable media may include all kinds of recording media in which data that can be read by a computer system are stored. Examples of the computer-readable recording media may include ROM, RAM, CD-ROM, magnetic tapes, floppy disks, optical data storage device, and so on. The examples of the computer-readable recording media may also include a carrier wave (for example, transmission over the Internet). Further, the computer-readable recording media may be distributed in computer systems connected over a network, and codes that can be read by computers may be stored and executed in the distributed recording media in a distributed manner. In addition, functional programs, codes, and code segments for implementing the present invention can be easily inferred by programmers having ordinary skill in the art of the present invention.

While the invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

What is claimed is:

1. A plasma display apparatus comprising:

a plasma display panel including a plurality of scan electrodes and sustain electrodes formed on an upper substrate, and a plurality of address electrodes formed on a lower substrate; and

a driver for supplying driving signals to the plurality of electrodes:

wherein the plurality of scan electrodes are divided into first and second groups and then supplied with scan signal, and in at least one period of an address period, first and second scan bias voltages supplied to the first and second groups, respectively, are different from each other,

when the second scan bias voltage supplied in a first subfield of first and second subfields is higher than that supplied in the second subfield of the first and second subfields, a lowest voltage of a reset signal supplied to the second group is higher in the second subfield of the first and second subfields than in the first subfield of the first and second subfields during a reset period,

wherein in at least one of the first and second subfields, the second scan bias voltage supplied to first and second scan electrodes of a plurality of scan electrodes belonging to the second group are different from each other, the second scan bias voltage supplied to the first scan electrode of the first and second scan electrodes is higher than that supplied to the second scan electrode of the first and second scan electrodes, and

the lowest voltage of the reset signal is higher in the second scan electrode of the first and second scan electrodes than in the first scan electrode of the first and second scan electrodes.

2. The plasma display apparatus of claim 1, wherein:

the address period includes first and second group scan periods in which the scan signals are supplied to the first and second groups, respectively, and

in the first group scan period, the first scan bias voltage is higher than the second scan bias voltage.

3. The plasma display apparatus of claim 1, wherein the first and second subfields belong to different frames.

4. The plasma display apparatus of claim 1, wherein the second scan bias voltage is higher than the first scan bias voltage and lower than a sustain voltage.

5. The plasma display apparatus of claim 1, wherein the lowest voltage of the reset signal supplied to the second group is higher than a scan voltage and lower than the first scan bias voltage.

6. The plasma display apparatus of claim 1, wherein:

the address period includes first and second group scan periods in which the scan signals are supplied to the first and second groups, respectively, and

a scan bias voltage supplied to the second group during the first group scan period is higher than a scan bias voltage supplied to the second group during the second group scan period.

7. The plasma display apparatus of claim 1, wherein at least one of lowest voltages of the second scan bias voltage and the reset signal supplied to the second group is varied depending on a temperature of the plasma display apparatus.

8. The plasma display apparatus of claim 1, wherein:

the address period sequentially includes first and second scan periods in which scan signals are supplied to first and second subgroups belonging to the first group, respectively, and

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in the first scan period, a first scan bias voltage supplied to the first subgroup is lower than a second scan bias voltage supplied to the second subgroup.

9. The plasma display apparatus of claim 8, wherein the second scan bias voltage is higher than a third scan bias voltage supplied to the second subgroup during the second scan period.

10. The plasma display apparatus of claim 1, wherein: the address period sequentially includes first and second group scan periods in which the scan signals are supplied to the first and second groups, respectively, and in a period between the first and second group scan periods, a setdown signal that gradually falls is applied to at least one of the first and second groups.

11. The plasma display apparatus of claim 10, wherein the lowest voltage of the reset signal supplied to the second group is higher than a lowest voltage of the setdown signal supplied to the second group in the period between the first and second group scan periods.

12. The plasma display apparatus of claim 10, wherein a lowest voltage of a reset signal supplied to the first group is lower than the lowest voltage of the reset signal supplied to the second group.

13. The plasma display apparatus of claim 1, wherein a lowest voltage of a reset signal supplied to at least one of the first and second groups is higher than a scan voltage of a negative polarity.

14. The plasma display apparatus of claim 1, wherein a discontinuous setdown signal is supplied to at least one of the first and second groups in the reset period, wherein the discontinuous setdown signal sequentially includes a first falling period in which a voltage gradually falls to a first voltage, a sustain period in which the first voltage is sustained, and a second falling period in which a voltage gradually falls from the first voltage.

15. A method of driving a plasma display panel comprising a plurality of scan electrodes and sustain electrodes formed on an upper substrate, and a plurality of address electrodes formed on a lower substrate, the method comprising the step of:

dividing the plurality of scan electrodes into first and second groups,

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wherein an address period includes first and second group scan periods in which scan signals are supplied to the first and second groups,

in the first group scan period, a second scan bias voltage supplied to the second group is higher than a first scan bias voltage supplied to the first group,

when the second scan bias voltage supplied in a first subfield of first and second subfields is higher than that supplied in the second subfield of the first and second subfields, a lowest voltage of a reset signal supplied to the second group is higher in the second subfield of the first and second subfields than in the first subfield of the first and second subfields,

wherein in at least one of the first and second subfields, the second scan bias voltage supplied to first and second scan electrodes of a plurality of scan electrodes belonging to the second group are different from each other, the second scan bias voltage supplied to the first scan electrode of the first and second scan electrodes is higher than that supplied to the second scan electrode of the first and second scan electrodes, and

the lowest voltage of the reset signal is higher in the second scan electrode of the first and second scan electrodes than in the first scan electrode of the first and second scan electrodes.

16. The method of claim 15, wherein the first and second subfields belong to different frames.

17. The method of claim 15, wherein:

the address period sequentially includes first and second scan periods in which scan signals are supplied to first and second subgroups belonging to the first group, respectively, and

in the first scan period, a first scan bias voltage supplied to the first subgroup is lower than a second scan bias voltage supplied to the second subgroup.

18. The method of claim 15, wherein in a period between the first and second group scan periods, a setdown signal that gradually falls is applied to at least one of the first and second groups.

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